Programmed Math

A Sullivan Associates Program

California State Series

Book 8

Measurement

DISCARD

PROGRAMMED MATH

Marjorie Doyle Sullivan
Sullivan Associates

Book 8 Measurement

This Is a California

STATE TEXTBOOK

- It is the duty of the pupils to assist the State by guarding and using this book with care, so that it may yield good service.
- If a pupil should lose or damage the book, he may be required to pay for the loss or damage.
- It is the duty of teachers to encourage and enforce these provisions.

Book No. _____

_____ *School District*

in _____ *County*

Date of issue _____, 19____

NOTE TO THE INSTRUCTOR

Measurement is the eighth book of this series. If your students have not used Book 7, explain the use of the slider, tell them to open this book to page 1, and give them the following instructions:

"Look at the three-inch line in the first box on this page. Read the first sentence to yourself. The question under it asks, 'How many inches are there?' What is the answer -- 2 or 3? Circle the number 3; then pull the slider down to the first black line and check your answer. Now read the last sentence in the box to yourself.

"In the next box there is a four-inch line and a sentence with a blank in it. Read the sentence, write the correct number in the blank, and then pull the slider down to check your answer.

"The first sentence in the last box on this page also has a blank in it. Write the correct number in the blank and check your answer. Read the next sentence to yourself; then answer the question that comes after it by circling either 'yes' or 'no.' Check your answer. Read the next sentence, answer the question, and check your answer.

"On this page you answered questions in two ways -- by circling the correct choice, or by filling in a blank. Before you turn the page, cover the answers on the next page with your slider, like this. (Demonstrate.) Now turn the page.

"Fill in the blank in the first sentence on page 2 and check your answer. Now read the paragraph. It ends with a question. Answer by putting a check mark before either 'yes' or 'no.' Check your answer. Now read the next paragraph and choose the correct answer by putting a check mark in front of it. Check your answer. Do the rest of the page by yourself. Remember to pull the slider down to check each answer after you have made it. When you have finished the page, look up at me."

When all the students have finished page 2, tell them to turn the page. Continue as follows:

"Read the sentences in the first box to yourself. In the last sentence there are two numbers on branches. Circle the right number. Now you are going to go on through the book by yourself. But first, let's go over the different ways you have of making your answers. When you have a choice on branches, what do you do? When you see a blank, what do you do? When you have several choices with short blanks in front of them, what do you do? All right. Now go on working by yourself. Don't forget to cover the answer column before you begin a new page, and remember to check each answer as soon as you have made it."

If any student still doesn't seem to understand what to do, continue to help him through the book until he is ready to work by himself. For more complete instructions, see the accompanying teacher's manual.

A Sullivan Associates Program

Copyright © 1968 by Sullivan Press. All Rights Reserved. Printed in the United States of America. This book, or parts thereof, may not be reproduced in any form without written permission of the publishers.

CALIFORNIA STATE SERIES published by
CALIFORNIA STATE DEPARTMENT OF EDUCATION, Sacramento, 1970

Here is a line divided into inches.

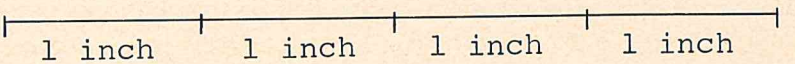
3

How many inches are there?

2

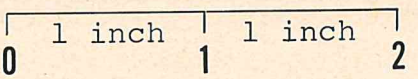
3

So we can say that this line is 3 inches long.



4

This line is ___ inches long.



2

This line is ___ inches long.

Look at the space between the left end of the line, marked 0, and the end of the first inch, marked 1.

yes

Is that space 1 inch long?

yes

no

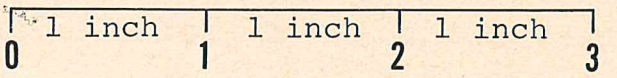
Now look at the space between the 0 end of the line and the end of the second inch, marked 2.

yes

Is that space 2 inches long?

yes

no



3

This line is ___ inches long.

√ yes

Look at the number 1. Does the 1 mean that the space from the 0 end of the line to the number 1 is 1 inch?

___ yes

___ no

√ 2 inches

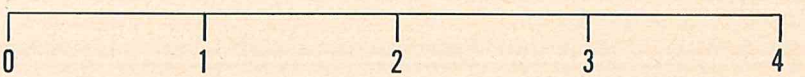
Look at the number 2. It means that the space from the 0 end of the line to the number 2 is

___ 2 inches.

___ 3 inches.

3

Look at the number 3. It means that the space from the 0 end of the line to the number 3 is ___ inches.



This line is divided into inches.

The part of the line that is between the numbers 1 and 2 is 1 inch long.

√ 1 inch long

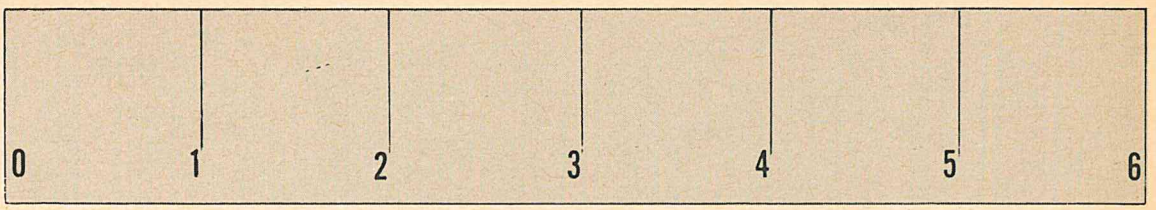
The part of the line that is between the numbers 2 and 3 is also

___ 1 inch long.

___ 2 inches long.

4

The whole line, from 0 to 4, is ___ inches long.

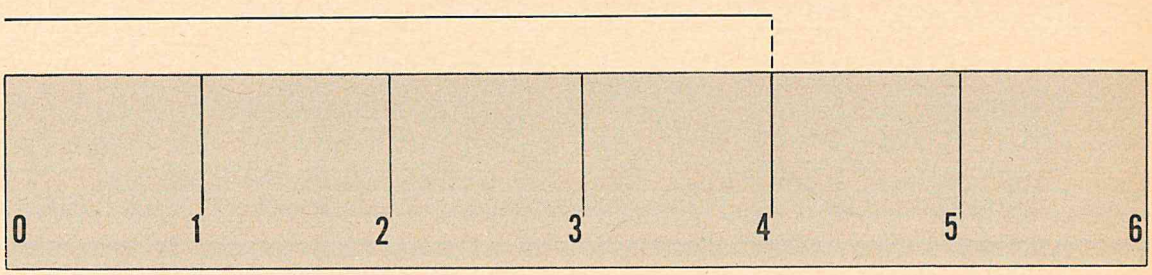


Here is a picture of a ruler.

A ruler is just a flat stick with inches marked on it.

We use rulers to <u>measure</u> lines.

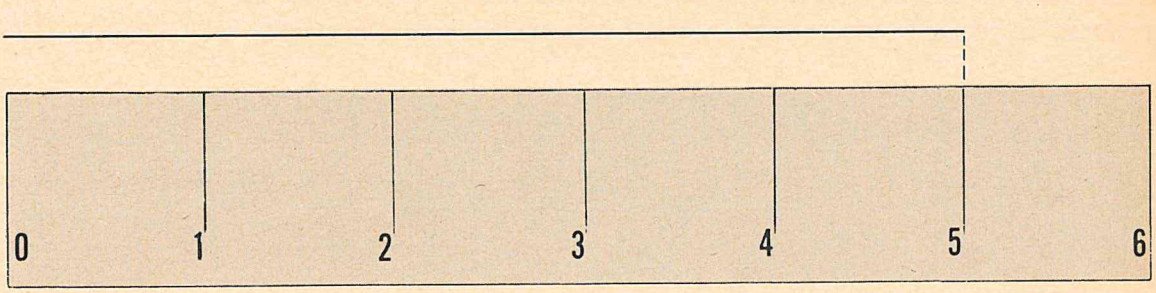
6 This ruler is $\begin{matrix} 3 \\ < \\ 6 \end{matrix}$ inches long.



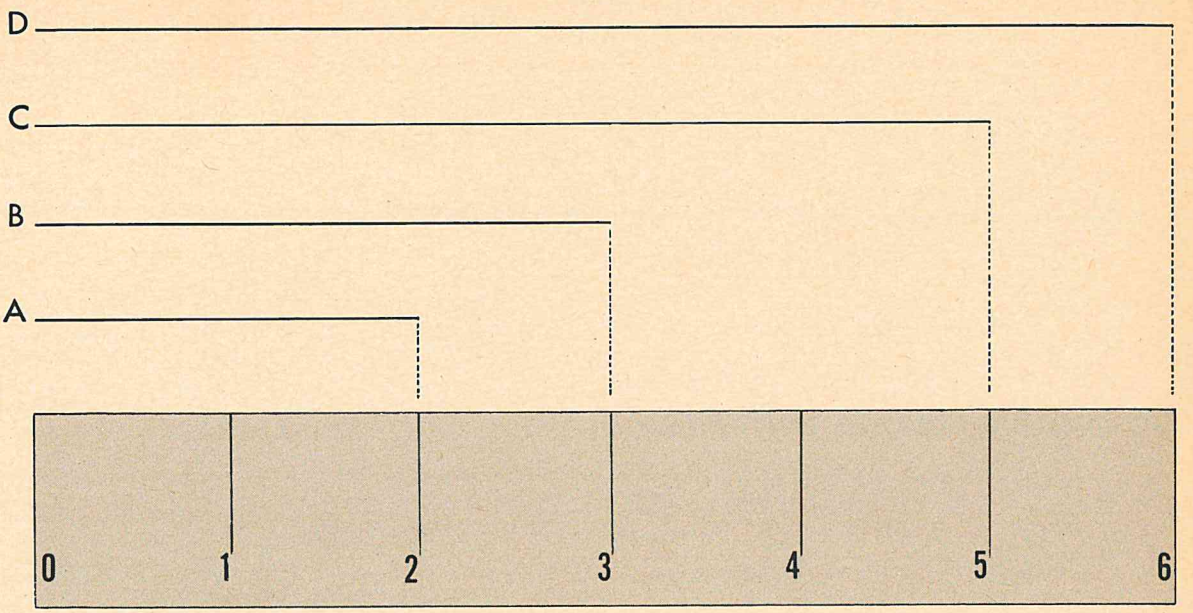
To measure the line above the ruler, we put the ruler down so that the 0 end of it is even with one end of the line.

Look at the right end of the line. It comes just to the 4 on the ruler.

4 So the line is ___ inches long.



5 The line above this ruler is ___ inches long.



2 Line A is ___ inches long.

3 Line B is ___ inches long.

5 Line C is ___ inches long.

6 Line D is ___ inches long.

1 Line B is ___ inch longer than line A.
(Subtract: 3 - 2 = ?)

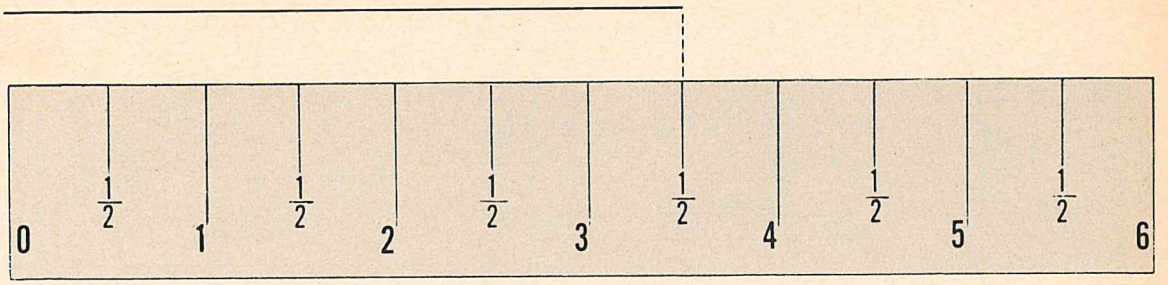
2 Line C is ___ inches longer than line B.

3 Line C is ___ inches longer than line A.

1 Line D is ___ inch longer than line C.

3 Line D is ___ inches longer than line B.

4 Line D is ___ inches longer than line A.



Every inch on this ruler has been divided into 2 equal parts.

Each of the 2 parts is $\frac{1}{2}$ inch.

Look at the line above the ruler.

more

It is more / less than 3 inches long.

less

But it is more / less than 4 inches long.

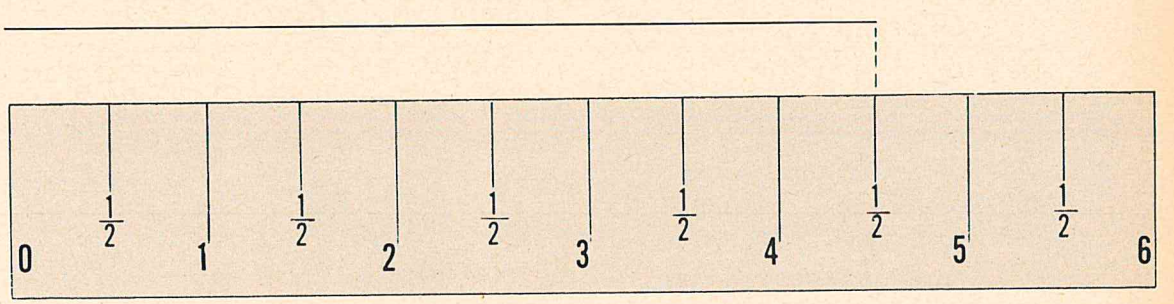
Does the line come just to the $\frac{1}{2}$-inch mark after the 3-inch mark?

√ yes

___ yes

___ no

So the line is 3 inches + $\frac{1}{2}$ inch, or $3\frac{1}{2}$ inches long.



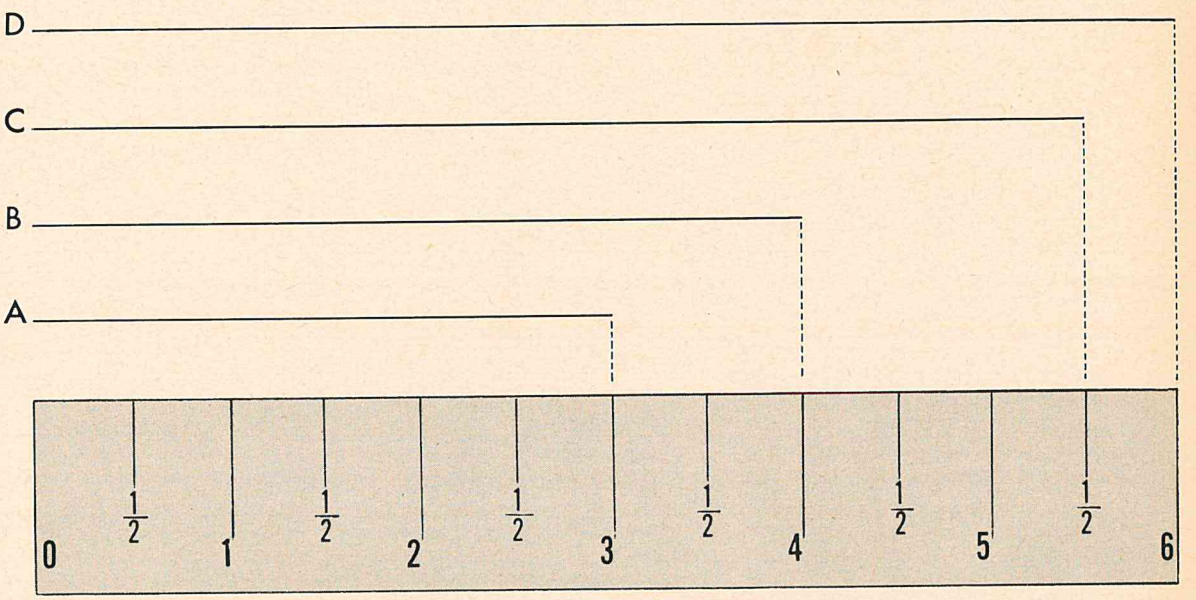
$4\frac{1}{2}$

The line above this ruler is $4\frac{1}{2}$ inches long.

TEST 1

lines

We have been using rulers to measure lines. / dots.



yes

Is this a ruler? yes / no

3

Line A is ___ inches long.

4

Line B is ___ inches long.

5 1/2

Line C is ___ 1/2 inches long.

6

Line D is ___ inches long.

1

Line B is ___ inch longer than line A.

1 1/2

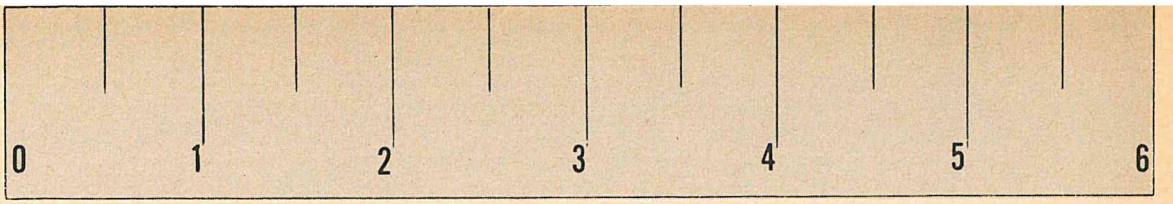
Line C is ___ 1/2 inches longer than line B.

2 1/2

Line C is ___ — inches longer than line A.

3

Line D is ___ inches longer than line A.

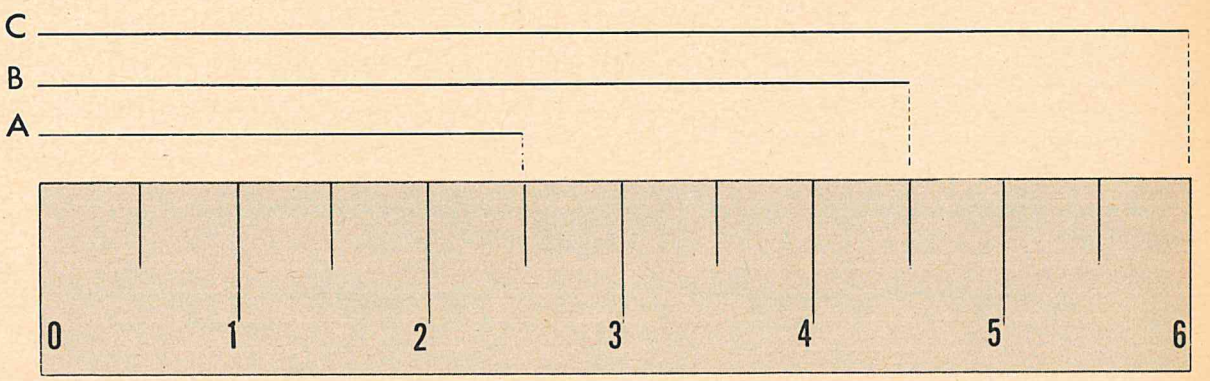


Sometimes the $\frac{1}{2}$-inch marks on a ruler don't have the fractions under them. But you can tell which ones they are.

The $\frac{1}{2}$-inch marks are right in the middle of the inches.

shorter

They are a bit shorter / longer than the inch marks.



$2\frac{1}{2}$

Line A is 2 — inches long.

$4\frac{1}{2}$

Line B is ___ — inches long

6

Line C is ___ inches long.

By subtracting, find out how much longer

2

line B is than line A:

$$\begin{array}{r} 4\frac{1}{2} \\ -\ 2\frac{1}{2} \\ \hline \end{array}$$

___ inches

$1\frac{1}{2}$

line C is than line B:

$$\begin{array}{r} 6 \\ -\ 4\frac{1}{2} \\ \hline ? \end{array} \longrightarrow \begin{array}{r} 5\frac{2}{2} \\ -\ 4\frac{1}{2} \\ \hline __\frac{\ }{\ } \end{array}$$

(Borrow $\frac{2}{2}$.)

inches

We can use the sign " to stand for inches.

3 " = 3 inches

$3\frac{2}{2}" - 2\frac{1}{2}" = 1\frac{1}{2}"$

$4" - 2\frac{1}{2}" = ?$ $\longrightarrow$ $3\frac{\ }{\ }" - 2\frac{1}{2}" = \ \frac{\ }{\ }"$ (Borrow $\frac{2}{2}$.)

$6\frac{2}{2}" - 3\frac{1}{2}" = 3\frac{1}{2}"$

$7" - 3\frac{1}{2}" = ?$ $\longrightarrow$ $\ \frac{\ }{\ }" - 3\frac{1}{2}" = \ \frac{\ }{\ }$ (Don't forget the sign for inches.)

$7\frac{2}{2}" - 2\frac{1}{2}" = 5\frac{1}{2}"$

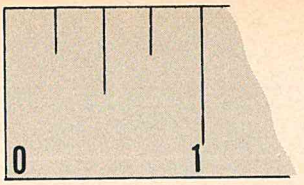
$8" - 2\frac{1}{2}" = ?$ $\longrightarrow$ $\ \frac{\ }{\ }" - \ \frac{\ }{\ }" = \ \frac{\ }{\ }$

$4\frac{1}{2}"$

$6" - 1\frac{1}{2}" = ?$ $\longrightarrow$

$5\frac{1}{2}"$

$9" - 3\frac{1}{2}" = ?$ $\longrightarrow$



This inch is divided into 4 equal parts.

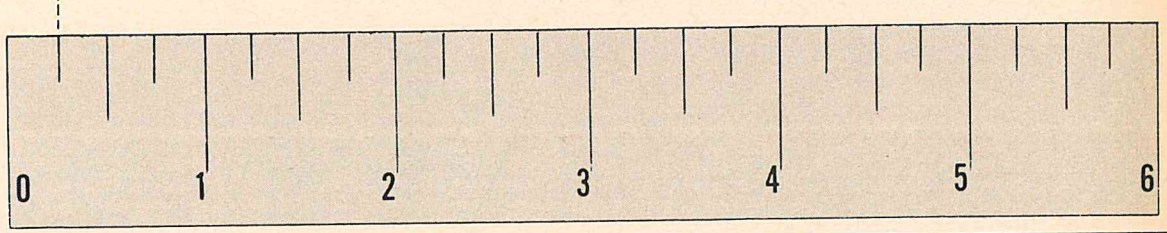
$\frac{1}{4}$

Each part is 1 of 4, or $\frac{1}{\quad}$ inch.

$\frac{1}{4}$

This line comes just to the first $\frac{1}{4}$-inch mark.

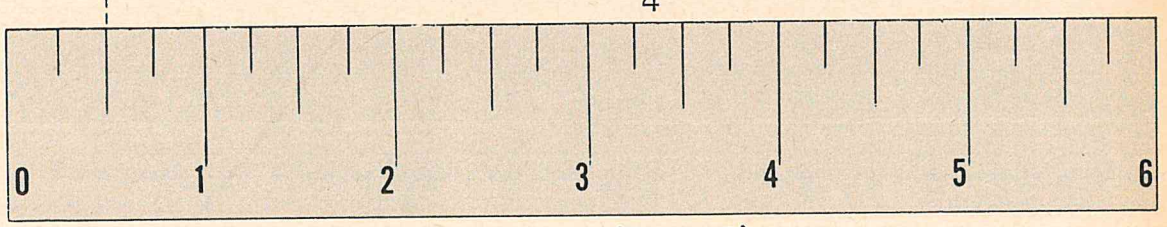
It is —— inch long.



$\frac{1}{2}$

This line comes to the second $\frac{1}{4}$-inch mark.

It is $\frac{2}{4}$ inch long.



But $\frac{2}{4}$ reduced is $\frac{\quad}{2}$. $\frac{(2 \div 2)}{(4 \div 2)}$

yes

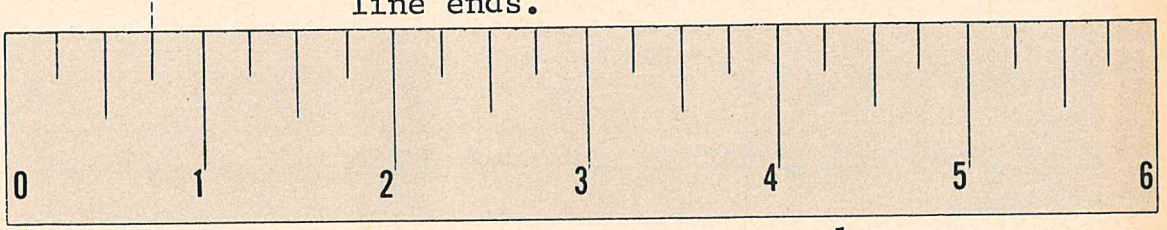
Does the line come to the $\frac{1}{2}$-inch mark?

yes

no

yes

Count the $\frac{1}{4}$-inch marks up to where this line ends.



(Remember, the $\frac{1}{2}$-inch mark is also a $\frac{1}{4}$-inch mark.

It marks $\frac{2}{4}$ inch.)

yes

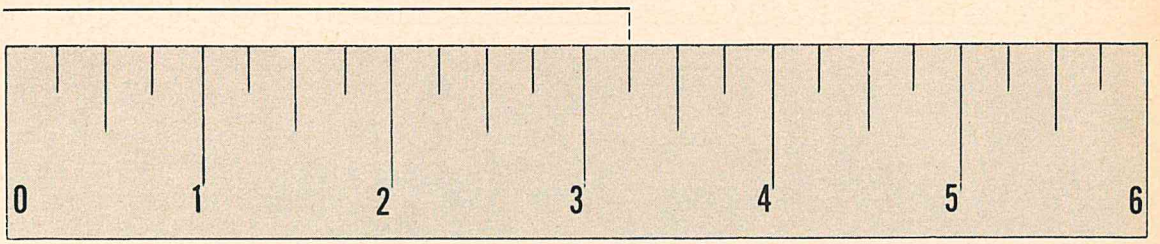
Is the line $\frac{3}{4}$ inch long?

yes

no

longer

This line is longer / shorter than 3 inches.



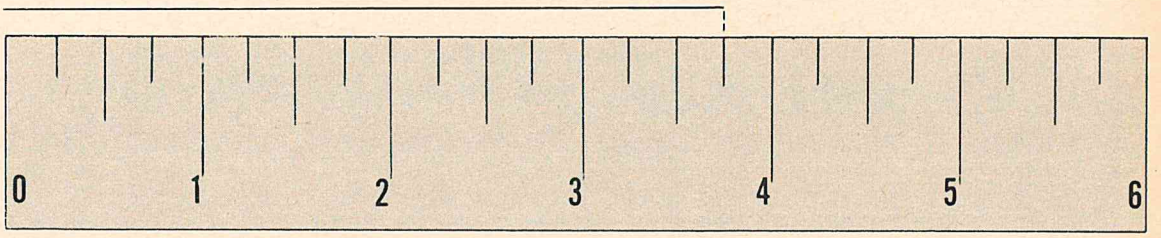
It comes just to the first $\frac{1}{4}$-inch mark after the 3-inch mark.

$3\ \frac{1}{4}$

So the line is $3\ \frac{1}{\ }$ inches long.

yes

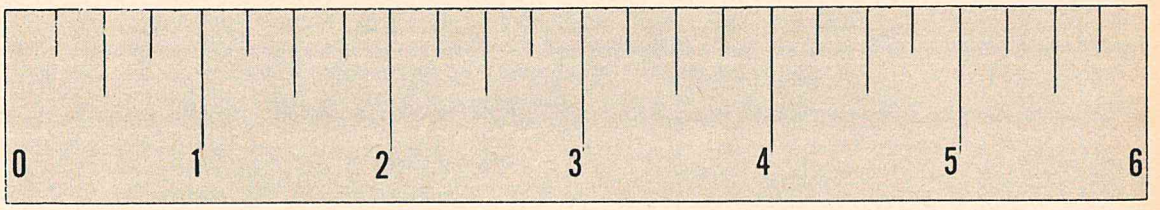
Is this line longer than 3 inches? yes / no



It comes just to the third $\frac{1}{4}$-inch mark after the 3-inch mark.

$3\ \frac{3}{4}$

The line is $3\ \frac{3}{\ }$ inches long.



The longest marks on this ruler mark the inches.

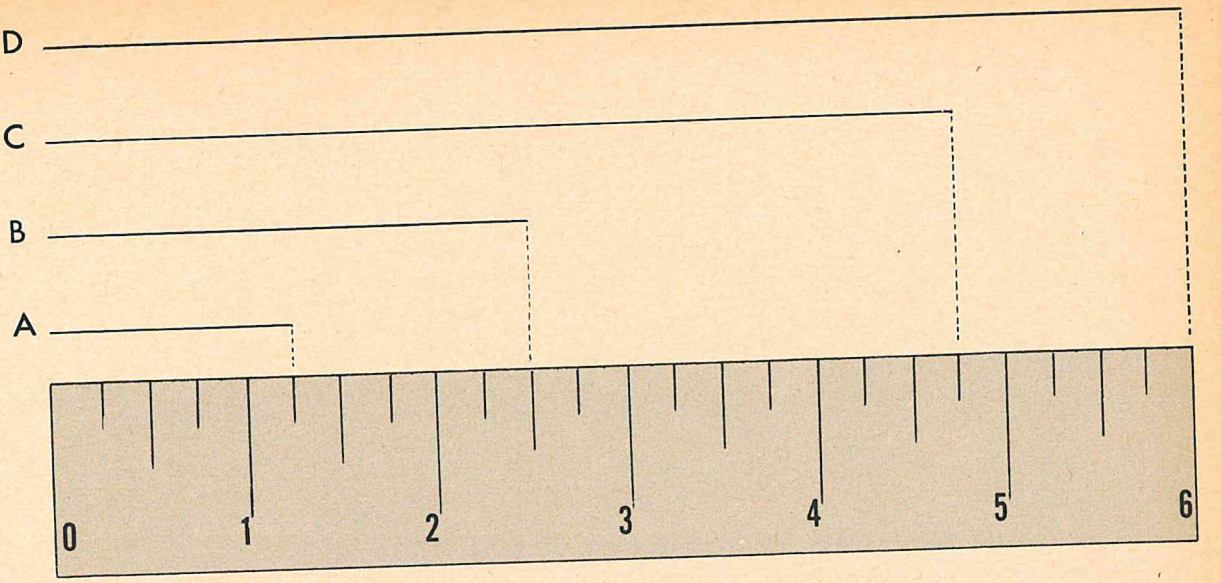
$\frac{1}{4}$

The shortest marks on the ruler mark the $\frac{1}{\ }$ inches.

The mark in the middle of each inch marks $\frac{2}{4}$ inch,

$\frac{1}{2}$

or $\frac{1}{\ }$ inch.



$1\frac{1}{4}$

Line A is ___ $\frac{}{4}$ inches long.

$2\frac{1}{2}$

Line B is ___ $\frac{}{2}$ inches long.

$4\frac{3}{4}$

Line C is ___ $\frac{3}{}$ inches long.

6

Line D is ___ inches long.

$1\frac{1}{4}$"

By subtracting, find out how much longer

B is than A:

$$2\tfrac{1}{2}" \qquad 2\tfrac{2}{4}" \text{ (Raise } \tfrac{1}{2} \text{ to } \tfrac{2}{4}.)$$
$$-\ 1\tfrac{1}{4}" \longrightarrow -\ 1\tfrac{1}{4}"$$
$$? \qquad __"$$

$4\frac{3}{4}$"
$- 2\frac{2}{4}$"
$2\frac{1}{4}$"

C is than B:

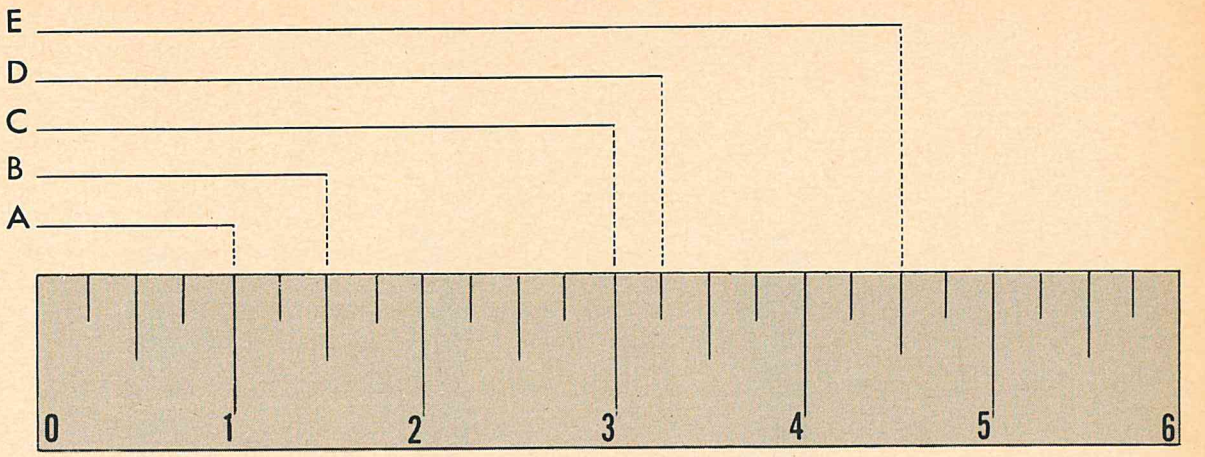
$$4\tfrac{3}{4}" \qquad 4\tfrac{3}{4}"$$
$$-\ 2\tfrac{1}{2}" \longrightarrow -\ 2__" \text{ (Raise } \tfrac{1}{2} \text{ to ?)}$$
$$? \qquad __"$$

$1\frac{1}{4}$"

D is than C:

$$6" \qquad 5\tfrac{4}{4}" \text{ (Borrow } \tfrac{4}{4}.)$$
$$-\ 4\tfrac{3}{4}" \longrightarrow -\ 4\tfrac{3}{4}"$$
$$?$$

TEST 2



1 Line A is ___ inch long.

$1\frac{1}{2}$ Line B is ___ — inches long.

3 Line C is ___ inch long.

$3\frac{1}{4}$ Line D is ___ — inches long.

$4\frac{1}{2}$ Line E is ___ — inches long.

By subtracting, find out how much longer

$\frac{1}{2}$ " B is than A: — " $(1\frac{1}{2} - 1 = ?)$

$1\frac{1}{2}$ " C is than B: 3 " (Borrow $\frac{2}{2}$.)

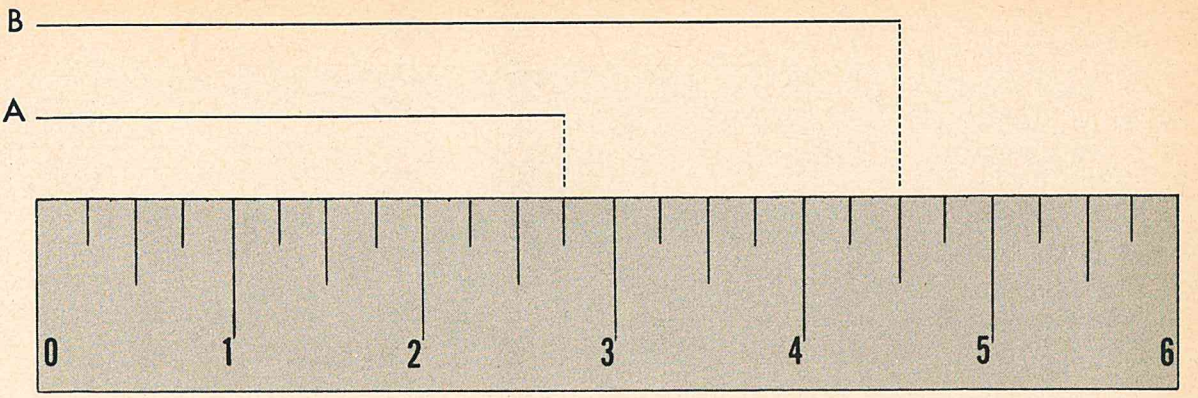
$$\begin{array}{r} 3\text{ "} \\ -\ 1\frac{1}{2}\text{ "} \\ \hline ? \end{array} \longrightarrow$$

$\frac{1}{4}$ " D is than C: — " $(3\frac{1}{4} - 3 = ?)$

$1\frac{1}{4}$ " E is than D: $4\frac{1}{2}$ " (Raise $\frac{1}{2}$ to ?)

$$\begin{array}{r} 4\frac{1}{2}\text{ "} \\ -\ 3\frac{1}{4}\text{ "} \\ \hline ? \end{array} \longrightarrow$$

3 " E is than B: ___ " $(4\frac{1}{2} - 1\frac{1}{2} = ?)$



$2\frac{3}{4}$"

Line A is ___ — " long.

$4\frac{1}{2}$"

Line B is ___ — " long.

Let's find out how much longer line B is than line A:

$$\begin{array}{r} 4\frac{1}{2}\text{"} \\ -\ 2\frac{3}{4}\text{"} \\ \hline ? \end{array} \longrightarrow \begin{array}{r} 4\frac{2}{4}\text{"} \\ -\ 2\frac{3}{4}\text{"} \\ \hline ? \end{array}$$

(Raise $\frac{1}{2}$ to $\frac{2}{4}$.)

Can we subtract $\frac{3}{4}$ from $\frac{2}{4}$?

no

yes

no

We have to borrow $\frac{4}{4}$ and add it to $\frac{2}{4}$.

$\frac{6}{4}$

$$\frac{4}{4} + \frac{2}{4} = \frac{\quad}{4}$$

so

$$\begin{array}{r} 4\frac{2}{4}\text{"} \\ -\ 2\frac{3}{4}\text{"} \\ \hline ? \end{array} \longrightarrow \begin{array}{r} 3\frac{6}{4}\text{"} \\ -\ 2\frac{3}{4}\text{"} \\ \hline \text{__}\text{"} \end{array}$$

$1\frac{3}{4}$"

$$\begin{array}{r} 4\frac{6}{4}\text{"} \\ -\ 1\frac{3}{4}\text{"} \\ \hline 3\frac{3}{4}\text{"} \end{array}$$

$$\begin{array}{r} 5\frac{1}{2}\text{"} \\ -\ 1\frac{3}{4}\text{"} \\ \hline ? \end{array} \longrightarrow \begin{array}{r} 5\frac{2}{4}\text{"} \\ -\ 1\frac{3}{4}\text{"} \\ \hline ? \end{array} \longrightarrow \begin{array}{r} 4\text{_}\text{"} \\ -\ 1\frac{3}{4}\text{"} \\ \hline \text{__}\text{"} \end{array}$$

(Borrow $\frac{4}{4}$.)

$4''$

$3''$

$2''$

Subtract:

$7\frac{1}{2}'' - 3\frac{1}{2}''$

$5\frac{1}{4}'' - 2\frac{1}{4}''$

$6\frac{3}{4}'' - 4\frac{3}{4}''$

$5\frac{1}{4}''$

$3\frac{1}{4}''$

$2\frac{1}{4}''$

$9\frac{1}{2}'' - 4\frac{1}{4}''$

$7\frac{1}{2}'' - 4\frac{1}{4}''$

$4\frac{1}{2}'' - 2\frac{1}{4}''$

$1\frac{1}{2}''$

$4\frac{3}{4}''$

$3\frac{1}{4}''$

$5\frac{1}{2}'' - 4''$

$6\frac{3}{4}'' - 2''$

$4\frac{1}{4}'' - 1''$

$3\frac{1}{2}''$

$7''$ (Borrow $\frac{2}{2}$.) $\longrightarrow$

$- 3\frac{1}{2}''$

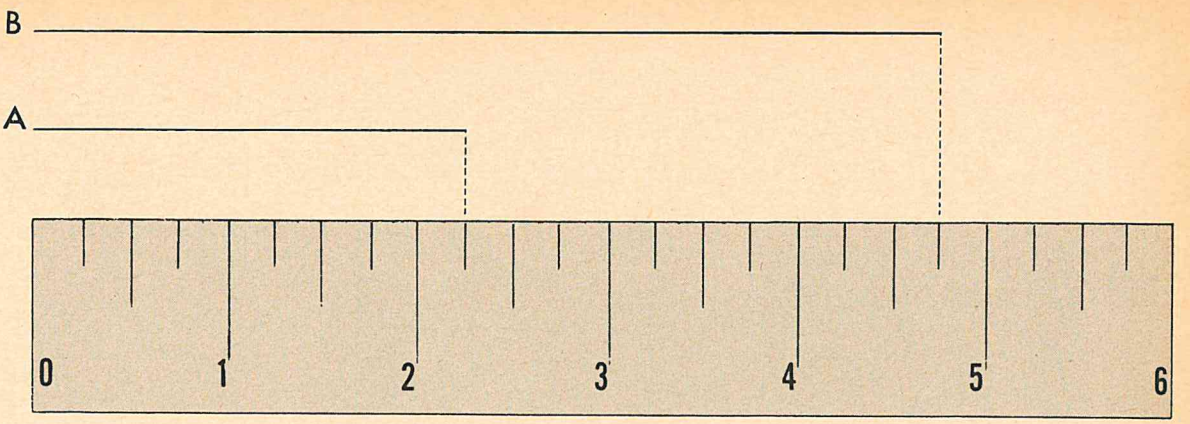
$?$

$7\frac{1}{4}''$

$9''$ (Borrow $\frac{4}{4}$.) $\longrightarrow$

$- 1\frac{3}{4}''$

$?$



$2\frac{1}{4}$"

Line A is ___ — " long.

$4\frac{3}{4}$"

Line B is ___ — " long.

Let's find out how much longer line B is than line A.

$$\begin{array}{r} 4\frac{3}{4}\text{"} \\ -\ 2\frac{1}{4}\text{"} \\ \hline \frac{2}{4}\text{"} \end{array}$$

$2\frac{2}{4}$"

Can $\frac{2}{4}$ be reduced? yes / no

yes

$\frac{2}{4} \longrightarrow \frac{\quad}{2}$

$\frac{1}{2}$

So line B is ___ — " longer than line A.

$2\frac{1}{2}$"

Reduce fractions whenever possible.

$3\frac{1}{4}$"

$$\begin{array}{r} 4\frac{1}{2}\text{"} \\ -\ 1\frac{1}{4}\text{"} \\ \hline \end{array}$$

$1\frac{1}{2}$"

$$\begin{array}{r} 5\frac{3}{4}\text{"} \\ -\ 4\frac{1}{4}\text{"} \\ \hline \end{array}$$

$$\begin{array}{r} 6\text{"} \\ -\ 4\frac{1}{4}\text{"} \\ \hline \end{array}$$

$1\frac{3}{4}$"

$\frac{1}{8}$ "

$\frac{1}{4}$ "

$\frac{1}{2}$ "

$\frac{3}{4}$ "

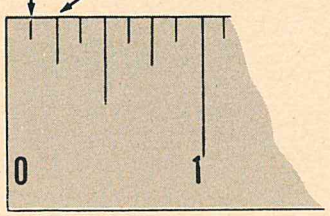
1 "

On some rulers each $\frac{1}{4}$ inch is divided into 2 equal parts.

Each part is $\frac{1}{2}$ of $\frac{1}{4}$, or $\frac{1}{\quad}$ inch. ($\frac{1}{2}$ x $\frac{1}{4}$ = ?)

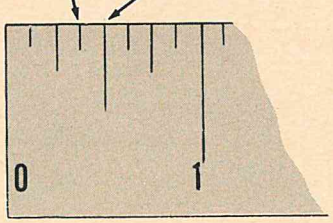
This mark shows $\frac{1}{8}$ ". This mark shows $\frac{2}{8}$ ", or $\frac{\quad}{\quad}$ ".

($\frac{2}{8}$ reduced is ?)



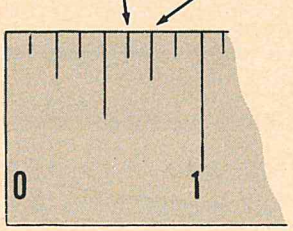
This mark shows $\frac{3}{8}$ ". This mark shows $\frac{4}{8}$ ", or $\frac{\quad}{\quad}$ ".

($\frac{4}{8}$ reduced is ?)

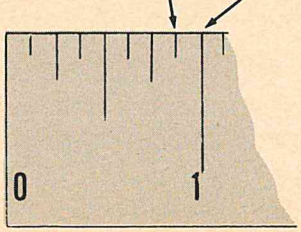


This mark shows $\frac{5}{8}$ ". This mark shows $\frac{6}{8}$ ", or $\frac{\quad}{\quad}$ ".

($\frac{6}{8}$ reduced is ?)



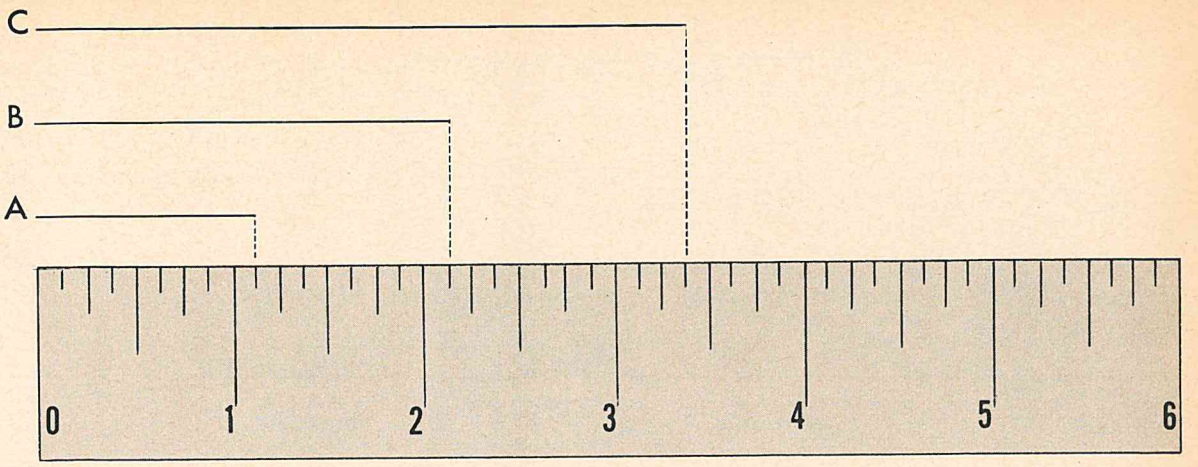
This mark shows $\frac{7}{8}$ ". This mark shows $\frac{8}{8}$ ", or ___".



$1\frac{1}{8}$"

$2\frac{1}{8}$"

$3\frac{3}{8}$"



Line A is ___ — " long.

Line B is ___ — " long.

Line C is ___ — " long.

---

1 "

Line B is ___ " longer than line A. ($2\frac{1}{8} - 1\frac{1}{8} = ?$)

Let's find out how much longer line C is than line B.

$$\begin{array}{r} 3\frac{3}{8}\text{"} \\ -\ 2\frac{1}{8}\text{"} \\ \hline \text{—}\frac{}{8}\text{"} \end{array}$$

$1\frac{2}{8}$"

yes

Can $\frac{2}{8}$ be reduced? yes / no

$\frac{1}{4}$

$\frac{2}{8} \longrightarrow \frac{}{4}$

$1\frac{1}{4}$"

So line C is ___ — " longer than line B.

$2\frac{1}{4}$"

$4\frac{3}{4}$"

$3\frac{1}{2}$"

$$\begin{array}{r} 3\frac{5}{8}\text{"} \\ -\ 1\frac{3}{8}\text{"} \\ \hline \end{array} \qquad \begin{array}{r} 7\frac{7}{8}\text{"} \\ -\ 3\frac{1}{8}\text{"} \\ \hline \end{array} \qquad \begin{array}{r} 5\frac{7}{8}\text{"} \\ -\ 2\frac{3}{8}\text{"} \\ \hline \end{array}$$

$2\frac{3}{4}$"

$3\frac{1}{4}$"

$5\frac{1}{2}$"

TEST 3

Subtract: (Reduce fractions whenever possible.)

$$6\tfrac{1}{2}" - 3\tfrac{3}{4}" \qquad 7\tfrac{1}{2}" - 4\tfrac{1}{4}" \qquad 7\tfrac{1}{2}" - 2"$$

4"

1 $\frac{1}{2}$"

4 $\frac{3}{4}$"

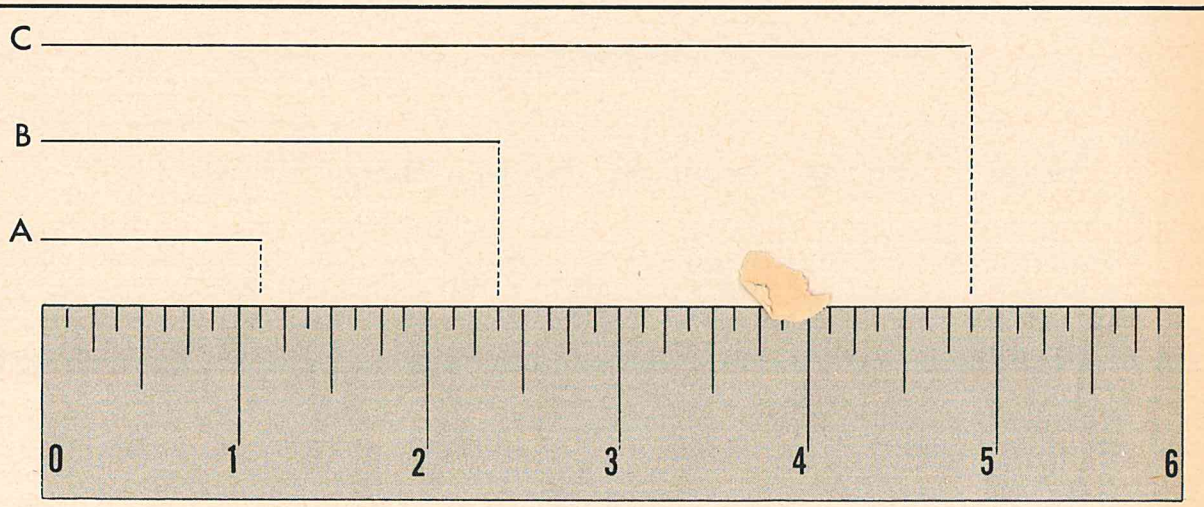
$$5\tfrac{1}{8}" - 1\tfrac{1}{8}" \qquad 9" - 7\tfrac{1}{2}" \qquad 8\tfrac{1}{2}" - 3\tfrac{3}{4}"$$

2 $\frac{3}{8}$"

1 $\frac{2}{8}$", 1 $\frac{1}{4}$"

4 $\frac{7}{8}$"

2 $\frac{4}{8}$", 2 $\frac{1}{2}$"



Line A is $1\frac{1}{8}$" long.

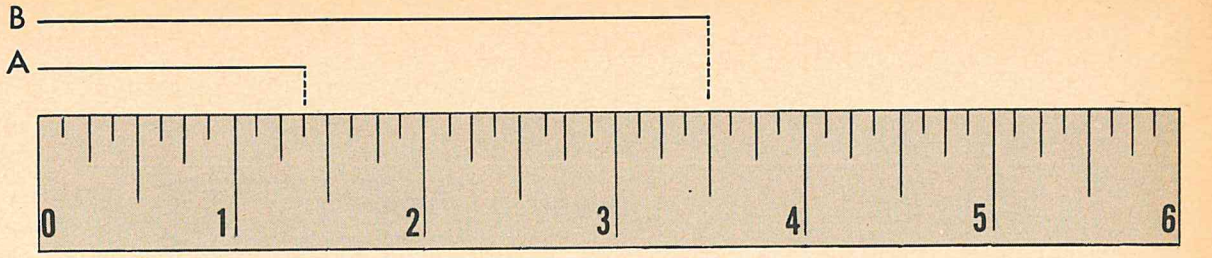
Line B is ___ —— " long.

It is ___ $\frac{2}{8}$", or ___ —— " longer than line A.

Line C is ___ —— " long.

It is ___ $\frac{4}{8}$", or ___ —— " longer than line B.

$1\frac{3}{8}$"



Line A is ___ — " long. Line B is $3\frac{1}{2}$" long.

Let's find out how much longer line B is than line A.

$2\frac{1}{8}$"

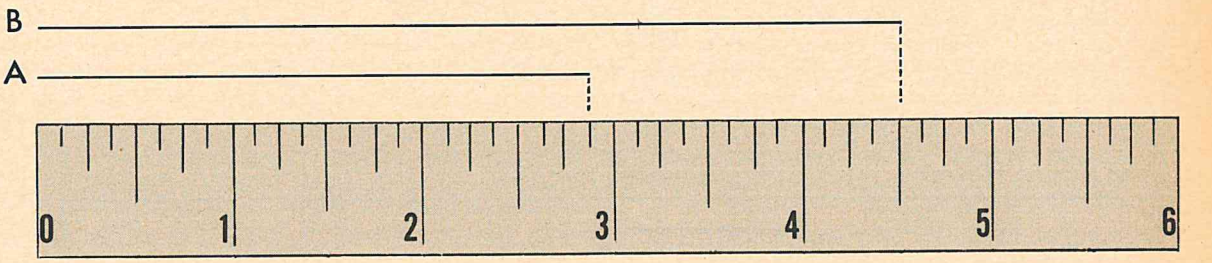
$$3\tfrac{1}{2}" \longrightarrow 3\tfrac{4}{8}" \quad \text{(Raise } \tfrac{1}{2} \text{ to } \tfrac{4}{8}\text{.)}$$

$$-\ 1\tfrac{3}{8}" \qquad -\ 1\tfrac{3}{8}"$$

$$? \qquad ___\ —\ "$$

$2\frac{7}{8}$"

$4\frac{1}{2}$"



Line A is ___ — " long. Line B is ___ $\frac{1}{2}$" long.

Let's find out how much longer line B is than line A.

$$4\tfrac{1}{2}" \longrightarrow 4\tfrac{4}{8}"$$

$$-\ 2\tfrac{7}{8}" \qquad -\ 2\tfrac{7}{8}"$$

$$? \qquad ?$$

no

Can we subtract $\frac{7}{8}$ from $\frac{4}{8}$? yes / no

$\frac{12}{8}$

We have to borrow $\frac{8}{8}$ and add it to $\frac{4}{8}$.

$$\tfrac{8}{8} + \tfrac{4}{8} = \tfrac{\quad}{8}$$

$1\frac{5}{8}$"

so

$$4\tfrac{4}{8}" \longrightarrow 3\tfrac{12}{8}"$$

$$-\ 2\tfrac{7}{8}" \qquad -\ 2\tfrac{7}{8}"$$

$$? \qquad ___\ —\ "$$

$3\frac{1}{2}$"

$1\frac{1}{8}$"

$2\frac{1}{4}$"

Reduce fractions in answers wherever possible.

$7\frac{5}{8}$" − $4\frac{1}{8}$"

$6\frac{1}{8}$" − 5"

$5\frac{5}{8}$" − $3\frac{3}{8}$"

$1\frac{5}{8}$"

$2\frac{3}{8}$"

$6\frac{1}{8}$"

(Borrow $\frac{8}{8}$.)

8" − $6\frac{3}{8}$"

7" − $4\frac{5}{8}$"

9" − $2\frac{7}{8}$"

$3\frac{7}{8}$"

$\frac{7}{8}$"

$2\frac{5}{8}$"

$9\frac{1}{2}$" − $5\frac{5}{8}$"

$7\frac{1}{4}$" − $6\frac{3}{8}$"

$4\frac{1}{2}$" − $1\frac{7}{8}$"

$3\frac{3}{4}$"

1"

$2\frac{3}{4}$"

$6\frac{3}{8}$" − $2\frac{5}{8}$"

$9\frac{7}{8}$" − $8\frac{7}{8}$"

$5\frac{5}{8}$" − $2\frac{7}{8}$"

$\frac{3}{4}$"

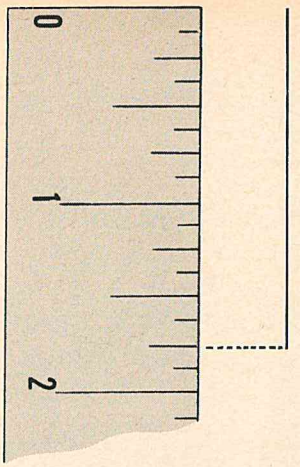
$1\frac{1}{2}$"

$2\frac{1}{2}$"

$5\frac{1}{2}$" − $4\frac{3}{4}$"

$7\frac{1}{4}$" − $5\frac{3}{4}$"

$4\frac{1}{2}$" − 2"



This line is straight up and down, so we put the ruler down the same way to measure the line.

The line is ___ — " long.

$1\frac{3}{4}$ "

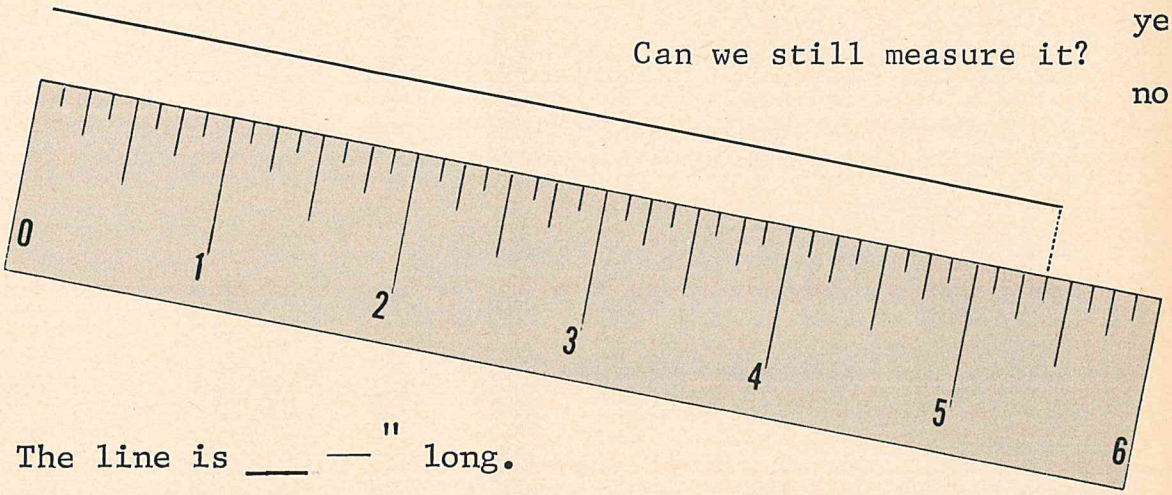
This line slants down to the right.

yes

Can we still measure it?

no

yes



The line is ___ — " long.

$5\frac{3}{8}$ "

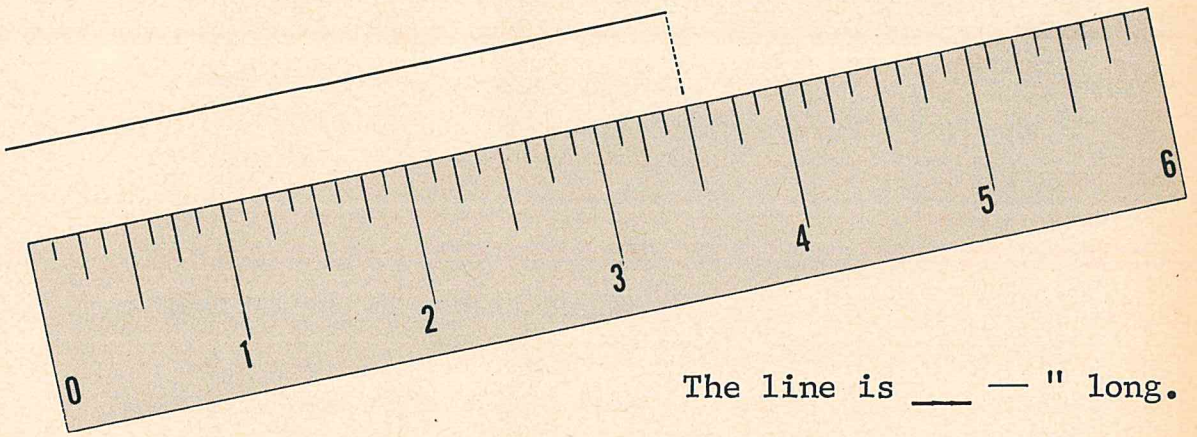
This line slants up to the right.

yes

Can we still measure it?

no

yes



The line is ___ — " long.

$3\frac{1}{2}$ "

We can measure <u>any</u> straight line with a ruler.

yes	You have been working with 6-inch rulers. The most common ruler is 12 inches long. This is because 12 inches = 1 foot. Is a 12-inch ruler 1 foot long? yes / no
5	A girl who is 60 inches tall is ____ feet tall. (60 ÷ 12 = ?)
dividing	You just changed inches to feet by dividing. / multiplying.
66	Let's change feet to inches. A girl who is $5\frac{1}{2}$ feet tall is ____ inches tall. ($5\frac{1}{2}$ x 12 = ?)
6	$\frac{1}{2}$ foot = ____ inches
3	$\frac{1}{4}$ foot = ____ inches
4	$\frac{1}{3}$ foot = ____ inches
multiply	To change inches to feet we divide by 12. To change feet to inches we multiply / divide by 12.
2	Change the inches to feet: (Divide by 12.) 24 inches = ____ feet
4	48 inches = ____ feet
10	120 inches = ____ feet

We can use the sign ' to stand for feet.

2 ' ⟶ ____ feet

$4\frac{1}{2}$ ' ⟶ ____ feet

17 ' ⟶ ____ feet

2

24 " = 2 ' means 24 inches = ____ feet.

3 '

36 " = ____ '

4 '

48 " = ____ '

6 '

72 " = ____ '

---

60 "

5 ' = ____ "

120 "

10 ' = ____ "

144 "

12 ' = ____ "

12

There are ____ inches in a foot.

To change inches to feet we divide by 12.

multiply

To change feet to inches we divide / multiply by 12.

---

inches

" ⟵ This is the sign for inches. / feet.

4 '

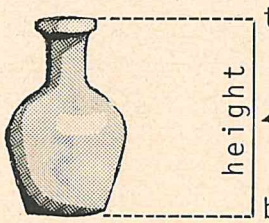
Put in the sign for feet: 4 feet ⟶ 4

TEST 4

$2\frac{1}{2}$"	$6\frac{3}{4}$" − $4\frac{1}{4}$" = ____ $7\frac{3}{8}$" − $4\frac{1}{8}$" = ____
$3\frac{1}{4}$"	
$2\frac{3}{8}$"	$5\frac{1}{2}$" − $3\frac{1}{8}$" = ____ $9\frac{3}{8}$" − $7\frac{1}{4}$" = ____
$2\frac{1}{8}$"	
12 "	1 ' = _____ "
66 "	$5\frac{1}{2}$ ' = _____ "
1,248 "	104 ' = _____ "
12 '	144 " = _____ '
5 '	60 " = _____ '
$\frac{1}{2}$ '	6 " = _____ '

We find out how tall something is by measuring its <u>height</u>.

<u>Height</u> is a straight line up and down, from the bottom of something to its top.



If this line measured 25 inches, we would say that the height of the vase is ____ inches.

25

We could also give the height of the vase in feet, or in feet and inches.

Let's give its height in feet.

To change inches to feet we divide / multiply by 12.

divide

$$12 \overline{)\ 25}\quad \begin{matrix} __ \text{ r } 1 \\ 24 \\ 1 \end{matrix}$$

2 r 1

We can write the remainder as the <u>numerator</u> of a fraction. The denominator is the number we divided by.

So 25 inches ⟶ $2\ \frac{1}{12}$ feet.

Now let's give the height in feet and inches.

We have 2 feet and a fraction of a foot.

What is the fraction? —

$\frac{1}{12}$

$\frac{1}{12}$ x 12 = ___ inch

1

So the height of the vase is 2 feet ___ inch.

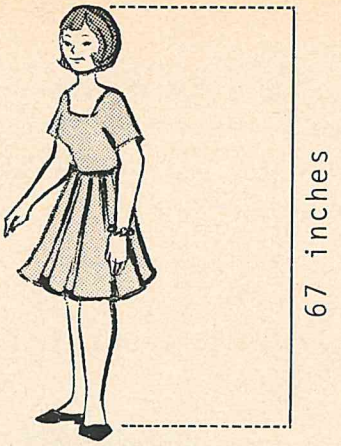
1

When we divide by 12 inches and get a remainder, the remainder is the number of extra inches.

$$12 \overline{)\ 38}\quad \begin{matrix} 3 \text{ r } __ \\ 36 \\ 2 \end{matrix} \longrightarrow 3 \text{ feet } ___ \text{ inches}$$

3 r 2 ⟶

3 feet
2 inches



The line marked 67 inches shows the height of this girl.

Give her height in feet:

$12 \overline{)67}$ r__ ⟶ ___ — feet

5 r 7 ⟶
5 $\frac{7}{12}$ feet

$\frac{7}{12}$ of a foot is ___ inches. ($\frac{7}{12}$ x 12 = ?)

7

So the girl's height in feet and inches is ___ feet ___ inches.

5 feet
7 inches

You have a strip of metal molding 8 feet long. You want to use some of it along the edge of a table.

You measure the length of the table edge and find that it is 65 inches long.

Find out how much molding you will have left after you edge the table.

Change 8 feet to inches: 8 x 12 = ____ inches

96

Subtract:

96
- 65

___ inches

31

Give this in feet:

$12 \overline{)31}$ r__ ⟶ ___ — feet

2 r 7 ⟶
2 $\frac{7}{12}$

Is this 2 feet 7 inches?

yes
no

yes

9 feet
7 inches

12 feet
11 inches

Add the feet and the inches:

6 feet 3 inches
+ 3 feet 4 inches
___feet ___inches

4 feet 8 inches
+ 8 feet 3 inches
___feet ___inches

12' 11"

Look at the first answer above.

We could also write it as 9' 7".

Write the second answer above with the signs for feet and inches: _____

26' 10"

144' 9"

Add: (Don't forget to put the signs in your answers.)

14' 6"
+ 12' 4"

100' 7"
+ 44' 2"

17' 14"

2"

18'

Add:

7' 6"
+ 10' 8"

There are 12 inches in a foot.

14" is ___" more than 1 foot.

It is 1' 2".

We add the 1 foot to 17 feet: 1' + 17' = ____'.

We have only 2" left over.

So our final answer is 18' 2".

1' 1"

43'

43' 1"

16' 4"
+ 26' 9"
42' 13" ← This is 1' ___".

We add 1 foot to 42 feet: 1' + 42' = ____'.

We have 1 inch left over.

Our final answer is ____' 1".

10' 29"

2' 5"

12'

12' 5"

$$\begin{array}{rr} 5' & 10'' \\ 4' & 9'' \\ +\ 1' & 10'' \\ \hline __' & __'' \end{array}$$

29" = ____' ____" (29 ÷ 12 = ? r ?)

We add 2 feet to 10 feet: 2' + 10' = ____'.

We have 5 inches left over.

So our final answer is ____' ____", or $12\frac{5}{12}$'.

16' 19"

17' 7"

$$\begin{array}{rr} 7' & 8'' \\ +\ 9' & 11'' \\ \hline __' & __'' \end{array}$$

Change the inches to feet and inches and add the extra foot to this answer.

Your final answer is ____' ____", or $17\frac{7}{12}$'.

25' 29"

27' 5",
$27\frac{5}{12}$'

$$\begin{array}{rr} 7' & 10'' \\ 8' & 11'' \\ +\ 10' & 8'' \\ \hline __' & __'' \end{array}$$

Final answer: ____' ____", or ____ $\frac{__}{12}$'.

26' 23"

27' 11",
$27\frac{11}{12}$'

$$\begin{array}{rr} 5' & 3'' \\ 19' & 11'' \\ +\ 2' & 9'' \\ \hline __' & __'' \end{array}$$

Final answer: ____' ____", or ____ $\frac{__}{__}$'.

6' 3"

7' 1",
$7\frac{1}{12}$'

Subtract:

$$\begin{array}{r} 9' \quad 8'' \\ -\ 3' \quad 5'' \\ \hline __' \quad __'' \end{array}$$

, or $6\frac{1}{4}$'

$$\begin{array}{r} 11' \quad 4'' \\ -\ 4' \quad 3'' \\ \hline \end{array}$$

, or $__\frac{\ }{12}$'

12"

$$\begin{array}{r} 7' \\ -\ 2' \quad 6'' \\ \hline ? \end{array}$$

We have to borrow 1 foot from the 7 feet.

1' = ___"

so $\begin{array}{r} 6 \\ \cancel{7}' \quad 12'' \\ -\ 2' \quad 6'' \\ \hline __' \quad __'' \end{array}$

4' 6",
$4\frac{1}{2}$'

$\longrightarrow 4\frac{6}{12}$', or $4\frac{\ }{2}$'

no

yes

Can we subtract 7 from 4?

no

$$\begin{array}{r} 3' \quad 4'' \\ -\ 1' \quad 7'' \\ \hline ? \end{array}$$

We have to borrow 1 foot (12 inches) from the 3 feet. We then add these 12 inches to the 4 inches.

12" + 4" = ___"

16"

so $\begin{array}{r} 2 \\ \cancel{3}' \quad 16'' \\ -\ 1' \quad 7'' \\ \hline __' \quad __'' \end{array}$

1' 9",
$1\frac{3}{4}$'

$\longrightarrow 1\frac{9}{12}$', or $__\frac{\ }{4}$'

$$\begin{array}{r} 8 \\ \cancel{9}' \ 13'' \\ -\ 3' \quad 6'' \\ \hline 5' \quad 7'', \end{array}$$

$5\frac{7}{12}$'

$$\begin{array}{r} 9' \quad 1'' \\ -\ 3' \quad 6'' \\ \hline ? \end{array}$$

(Borrow 12" and add them to 1".) $\longrightarrow$

$$\begin{array}{r} 8 \\ \cancel{9}' \quad __'' \\ -\ 3' \quad 6'' \\ \hline __' \quad __'' \end{array}$$

, or $__\frac{\ }{12}$'

TEST 5

5

A girl 60 inches tall is ___ feet tall.

42

If the height of a lamp is $3\frac{1}{2}$ ', the lamp is ____" tall.

6' 3"

75" = ___' ___"

22' 10"

$$\begin{array}{r} 15' \quad 7'' \\ +\ 7' \quad 3'' \\ \hline \end{array}$$

$$\begin{array}{r} 220' \quad 10'' \\ +\ 47' \quad 1'' \\ \hline \end{array}$$

267' 11"

12' 13"

$$\begin{array}{r} 5' \quad 3'' \\ +\ 7' \quad 10'' \\ \hline \end{array}$$

13' 1"

___' ___" ⟶ ___' ___"

3' 6"

$$\begin{array}{r} 10' \quad 11'' \\ -\ 7' \quad 5'' \\ \hline \end{array}$$

$3\frac{1}{2}$ '

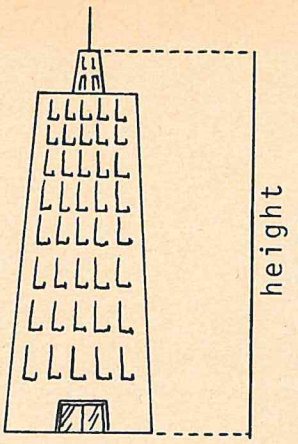
___' ___" , or ___'

1' 7"

$$\begin{array}{r} 3' \quad 2'' \\ -\ 1' \quad 7'' \\ \hline \end{array} \longrightarrow$$

?

138



The height of this building is 1,656 inches.

1,656 inches = _____ feet

138 feet = 46 yards

3

Since 138 feet = 46 yards,

$$1 \text{ yard} = 46 \overline{)\ 138}\ \begin{matrix}__\ \text{feet}\\ \hline\end{matrix}$$

3

36 inches = ___ feet or 1 yard

1

3 feet = ___ yard

2

6 feet = ___ yards (6 ÷ 3 = ?)

3

9 feet = ___ yards (9 ÷ 3 = ?)

4

12 feet = ___ yards

$1\frac{1}{2}$

$\frac{1}{2}$ yard = ___ feet ($\frac{1}{2}$ x 3 = ?)

$2\frac{1}{4}$

$\frac{3}{4}$ yard = ___ feet ($\frac{3}{4}$ x 3 = ?)

10

$3\frac{1}{3}$ yards = ____ feet

12

3

36

We can measure inches and feet with a ruler.

But most rulers are only 12 inches long.

To measure anything longer than 1 foot, or ____ inches, it is easier to use a longer ruler, called a yardstick.

There are ___ feet in a yard.

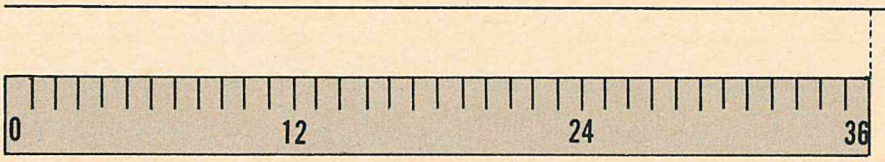
A yardstick is 1 yard, or 3 feet, long.

A yardstick is ____ inches long.

longer

Here is a picture of a yardstick.

Of course, a real yardstick is much longer / shorter than this.



A yardstick is not marked in feet. It is marked in inches, from 1" through 36".

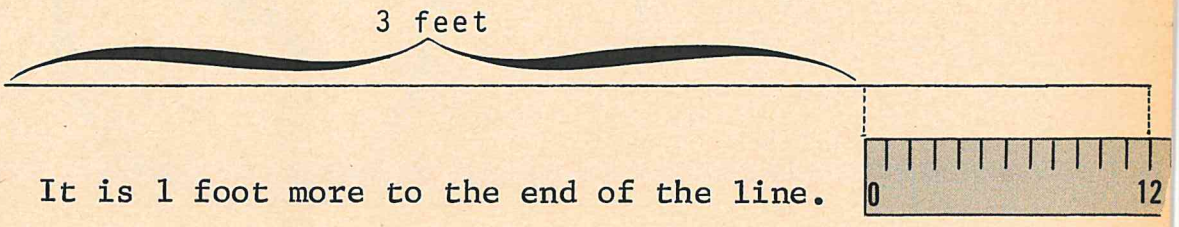
can

But 12" = 1 foot, so we can / cannot measure feet with a yardstick.

3

Look at the line above the yardstick. From the left end of the line to the 36-inch mark on the yardstick, the line is ___ feet long.

To measure the rest of the line, we have to pick up the yardstick and move it.



4

It is 1 foot more to the end of the line.

So the line is ___ feet long. (3 + 1 = ?)

$\frac{1}{3}$

1 foot is 1 of 3 feet in a yard, so 1 foot is $\frac{}{3}$ of a yard.

$1\frac{1}{3}$

We can say that the line is $1\frac{1}{}$ yards long.

An abbreviation is a short form of a word.

The abbreviation ft. is short for "feet."

The abbreviation in. is short for "inches."

The abbreviation yd. is short for "yards."

3 ft.	36 in. = ____ ft.
1 yd.	3 ft. = ____ yd.

Change to yards: (Divide by 3; write any remainder as the numerator of a fraction.)

$4\frac{2}{3}$ yd.	14 ft. = ___ $\frac{}{3}$ yd.
13 yd.	39 ft. = ____ yd.
$8\frac{1}{3}$ yd.	25 ft. = ___ — yd.

Change to feet: (Multiply by 3.)

54 ft.	18 yd. = ____ ft.
27 ft.	9 yd. = ____ ft.
22 ft.	$7\frac{1}{3}$ yd. = ____ ft.

divide	To change inches to feet, we multiply / divide by 12.
3	To change feet to yards, we divide by 12. / 3.

12	To change feet to inches, we multiply by ____.
3	To change yards to feet, we multiply by ___.

Add:

6 ft. 12 in.	2 ft. 5 in. + 4 ft. 7 in. __ ft. __ in. __ yd. __ ft. __ $\frac{_}{3}$ yd.
2 yd. 1 ft.	
$2\frac{1}{3}$ yd.	
24 ft. 24 in.	10 ft. 11 in. + 14 ft. 13 in. __ ft. __ in. __ yd. __ ft. __ $\frac{_}{3}$ yd.
8 yd. 2 ft.	
$8\frac{2}{3}$ yd.	
18 ft. 36 in.	6 ft. 25 in. + 12 ft. 11 in. __ ft. __ in. __ ft. __ yd. + __ yd. __ yd.
3 ft.	
6 yd. + 1 yd.	
7 yd.	

Subtract:

2 yd. 1 ft.,
$2\frac{1}{3}$ yd.

7 yd. 2 ft.
- 5 yd. 1 ft.

___ yd. ___ ft., or ___ — yd.

9 yd. 2 ft.
- 5 yd. 2 ft.

___ yd.

4 yd.

3 ft.

8 yd.
- 5 yd. 1 ft.

?

We have to borrow 1 yard from the 8 yards.

1 yd. = ___ ft.

2 yd. 2 ft.,
$2\frac{2}{3}$ yd.

so 7 ~~8~~ yd. 3 ft.
- 5 yd. 1 ft.

___ yd. ___ ft., or ___ — yd.

4 yd. 2 ft.,
$4\frac{2}{3}$ yd.

9 yd. 1 ft.
- 4 yd. 2 ft.

?

We borrow 1 yard (3 feet) from the 9 yards. Then we add the 3 feet to 1 foot.

so 8 ~~9~~ yd. 4 ft.
- 4 yd. 2 ft.

___ yd. ___ ft., or ___ — yd.

6
~~7~~ yd. 5 ft.
- 2 yd. 3 ft.

4 yd. 2 ft.,
$4\frac{2}{3}$ yd.

7 yd. 2 ft.
- 2 yd. 3 ft.

?

→

6
~~7~~ yd. ___ ft.
- 2 yd. 3 ft.

___ yd. ___ ft., or ___ — yd.

TEST 6

ft.

yd.

in.

Write the abbreviation for:

feet ____

yards ____

inches ____

$6\frac{2}{3}$ yd.

72 ft.

20 ft. = ___ — yd.

24 yd. = ____ ft.

9 ft. 12 in.

3 yd. 1 ft.

$3\frac{1}{3}$ yd.

2 ft. 4 in.
+ 7 ft. 8 in.

___ ft. ___ in.

___ yd. ___ ft.

___ — yd.

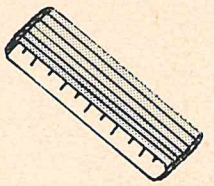
$\cancel{10}^{9}$ yd. 6 ft.
- 7 yd. 4 ft.
2 yd. 2 ft.

10 yd. 3 ft.
- 7 yd. 4 ft.
?

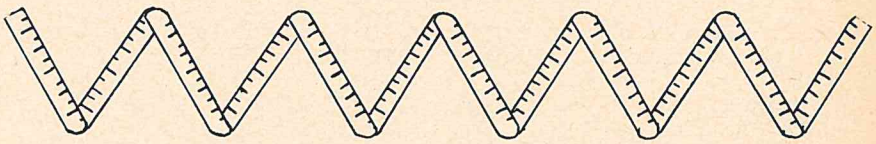
$\cancel{10}^{9}$ yd. ___ ft.
- 7 yd. 4 ft.
___ yd. ___ ft., or ___ — yd.

$2\frac{2}{3}$ yd.

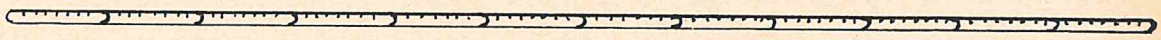
Anything that is marked off in inches, feet, or yards is a ruler. To measure very long lines, we have rulers even longer than a yardstick.



This is a carpenter's rule. It is made in sections and opens up, like this:



When it is opened to make a straight line, it looks like this:



Each section on a carpenter's rule is 6 inches long. Count the sections on this rule.

72 inches, 6 feet

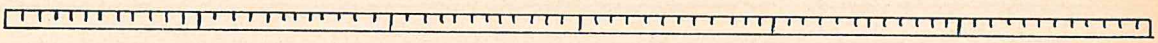
The rule is ____ inches, or ___ feet long.

2 yards

That is ___ yards.

We also have rulers in the form of metal or cloth tapes. These are called "measuring tapes."

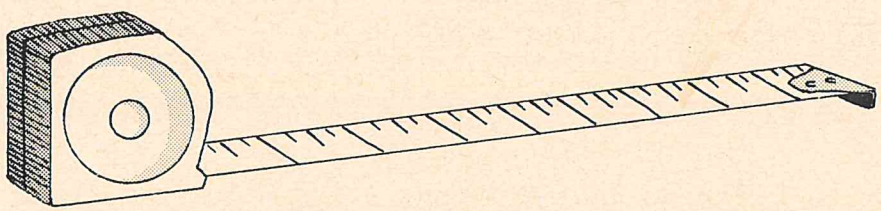
Dressmakers often use cloth tapes.



6 feet, 2 yards

If this cloth tape is 72 inches long, it is ___ feet, or ___ yards long.

Metal tapes usually roll up inside a round holder.



When this metal tape is pulled out as far as it will go, it measures 96 inches.

8 feet, $2\frac{2}{3}$ yards

That is ___ feet, or ___ ___ yards.

rulers

Yardsticks, carpenter's rules, and measuring tapes are all
- rulers.
- strings.

We use rulers to measure lines.

"How long" is called <u>length</u>.

height

"How tall" is called
- height.
- length.

yes

Are height and length straight lines?
- yes
- no

Can height and length be measured in inches, feet and yards?

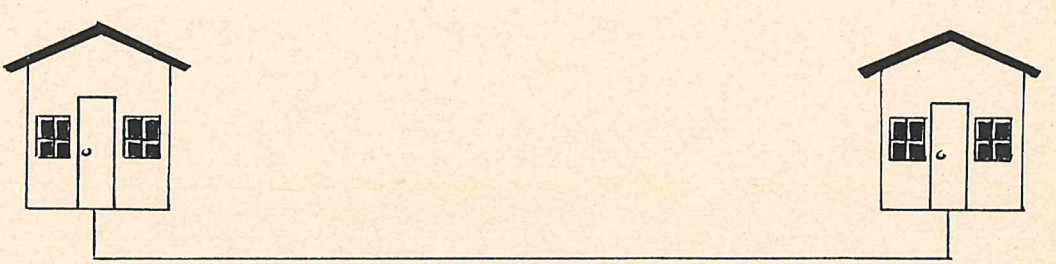
- ___ yes
- ___ no

√ yes

The measurement of lines is called <u>linear</u> measure.

<u>Distance</u> is a linear measure.

Distance tells "how far" it is from one place to another.



100

If it is 300 feet from the door of one house to the door of the other house, the <u>distance</u> between the doors is 300 feet, or _____ yards.

yes

Is <u>height</u> a linear measure?

yes

no

yes

Is <u>length</u> a linear measure?

yes

no

yes

Is <u>distance</u> a linear measure?

yes

no

Distance, like height and length, can be measured in inches, feet, and yards.

We usually measure very long distances in <u>miles</u>.

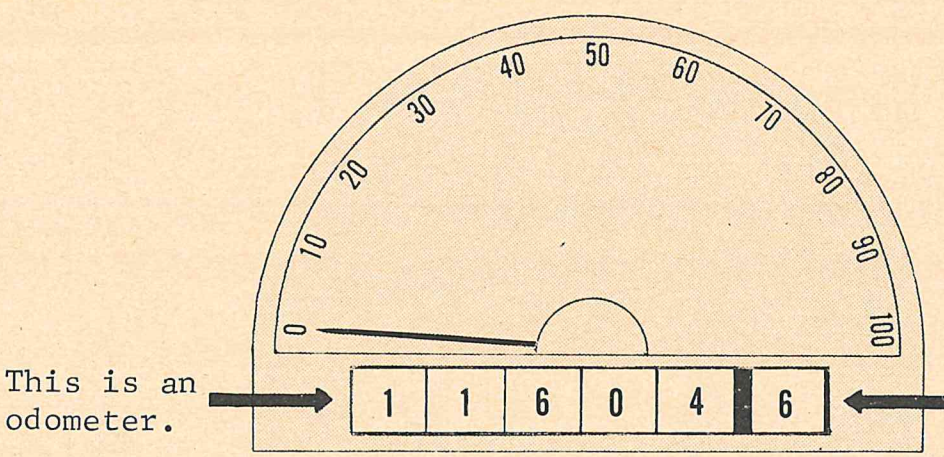
There are 5,280 feet in a mile.

15,840

There are _____ feet in 3 miles.

If we measured long distances in feet, or even in yards, we would have to work with very large numbers.

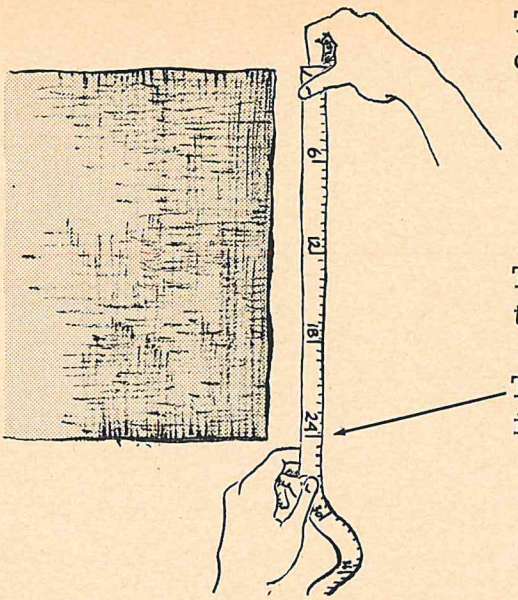
The odometer on a car's dashboard shows the number of miles the car has traveled. Part of a mile is shown as "tenths" on the right side of the odometer.



11,604.6

It reads 11,604.___ miles.

√ cloth tape



This person is measuring a piece of material with a

___ yardstick.

___ cloth tape.

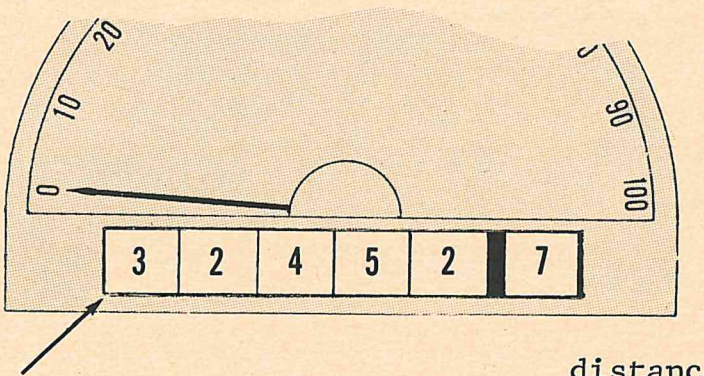
The 0 end of the tape is at the top.

The material comes to the ____ - inch mark on the tape.

24-inch

24 inches, 2 feet

The piece of material measures ____ inches, or ____ feet, on this side.



This is an odometer. It shows distance. / height.

distance

It reads ____,_____.___ miles.

32,452.7

The abbreviation for "inches" is in. .

12 in. = ___ ft.

1 ft.

The abbreviation for "feet" is ____ .

___ ft. = 1 yd.

ft.

3 ft.

The abbreviation for "yards" is ____ .

36 in. = ___ yd.

yd.

1 yd.

1 mi.

The abbreviation for "miles" is mi. , or just m .

5,280 ft. = ___ mi.

24 in.

Add:

	1,525 ft.	9 in.
	1,993 ft.	4 in.
+	1,760 ft.	11 in.
		___ in.
	_____ ft. +	___ ft.

5,278 ft. + 2 ft.

5,280 ft., 1 mi.

Add the feet. Your final answer is _____ ft., or ___ mi.

If you travel a certain number of miles in a certain time, you can find your rate of speed.

rate of speed = $\frac{\text{distance}}{\text{time}}$ ← Like the line in a fraction, this line means "divide if possible."

You travel 110 miles in 2 hours.

Your rate of speed is $\frac{110 \text{ miles}}{2 \text{ hours}}$.

If you divide, you will have your rate of speed for 1 hour:

55

$2\overline{)110}$

You can give this as "miles per hour," or mph .

55 mph

You traveled at a rate of ___ mph.

yes

Do we use a linear measure to find rate of speed? yes / no

TEST 7

1 yard

A yardstick is 1 yard / 4 yards long.

3

That is ___ feet.

longer

Carpenter's rules and measuring tapes are usually longer / shorter than yardsticks.

"How long"

"How long" / "How tall" is called length.

distance

"How far" is called height. / distance.

5,280

There are _____ feet in a mile.

miles

A car's odometer shows distance in miles. / yards.

mi.

The abbreviation for "miles" is ___. , or m .

√ miles per hour

The abbreviation mph stands for

___ miles per hour.

___ miles per height.

Find the mph:

$$\text{rate of speed} = \frac{400 \text{ miles}}{5 \text{ hours}}$$

80 mph

5 | 400

40

___ mph

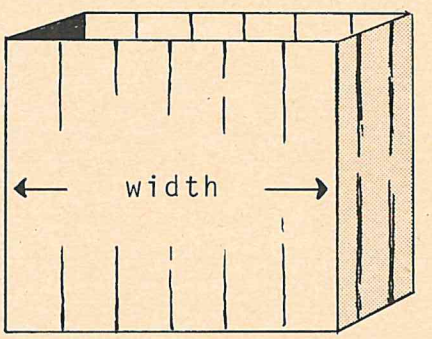
| ___

We have been working with linear measure.

We measure lines in inches, feet, yards and miles.

We use linear measure to find height, length and distance.

We can also use linear measure to find <u>width</u> ("how wide") and <u>depth</u> ("how deep").



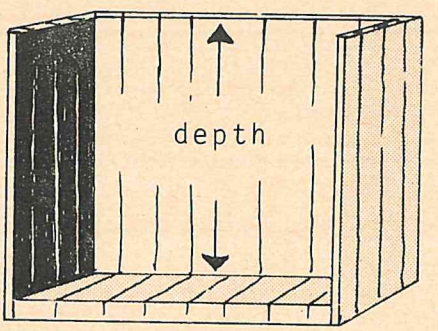
Here is a picture of a wooden crate.

Its <u>width</u> can be found by measuring a straight line across the front of it.

If its width is 30 inches, the crate is 30 inches,

$2\frac{1}{2}$

or ___ $\frac{}{2}$ feet <u>wide</u>.



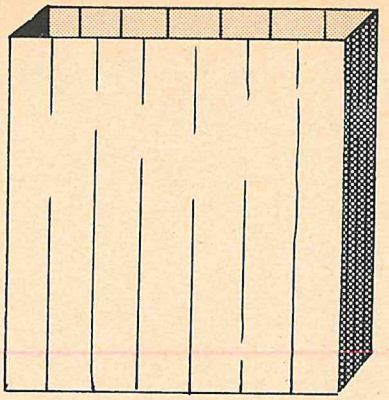
Here is the same crate with the front cut away so that we can see inside.

The <u>depth</u> of the crate is found by measuring a line from the top edge of one of the sides to the inside bottom of the crate.

If its depth is 26 inches, the crate is 26 inches,

$2\frac{1}{6}$

or ___ $\frac{}{6}$ feet <u>deep</u>.



Here is another crate.

We want to know the thickness ("how thick") of the bottom of the crate.

We first measure the height of the crate (on the outside). Let's say that it is 42 inches.

Next we measure the depth of the crate (on the inside). Let's say that it is 40 inches.

Now we subtract:

$$\begin{array}{rr} & 42 \text{ inches} \\ - & 40 \text{ inches} \\ \hline & __ \text{ inches} \end{array}$$

2

So we know that the crate's bottom is 2 inches thick.

Is thickness a linear measure? yes / no

yes

Sometimes it is very important to know both the inside measurement of a box or crate and its outside measurement.

For example, if you measured only the outside height of the crate above, you might think that a lamp 42 inches high would fit in the crate.

But inside the crate it is only 40 inches from the bottom to the top.

A 42-inch lamp (would / would not) fit in the crate.

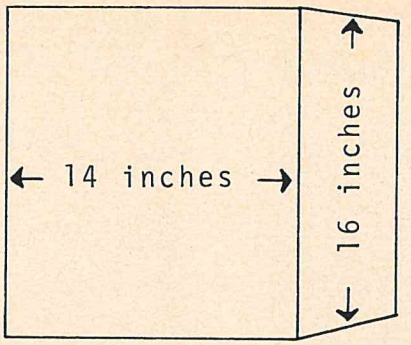
would not

14

$1\frac{1}{6}$

16

$1\frac{1}{3}$



The width of this box is ____ inches.

That is ____ $\frac{}{6}$ feet.

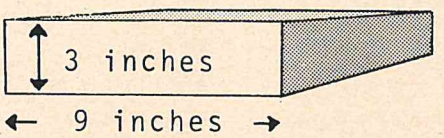
The height of the box is ____ inches.

That is ____ $\frac{}{3}$ feet.

3

9

3



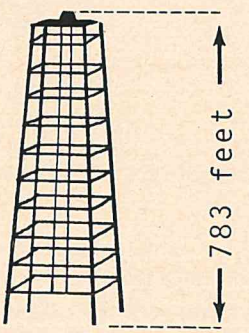
Here is a plank $\begin{matrix}3\\4\end{matrix}$ inches thick.

The length of the plank is ___ inches.

The length of the plank is ___ times longer than the width.
(9 ÷ 3 = ?)

783

261

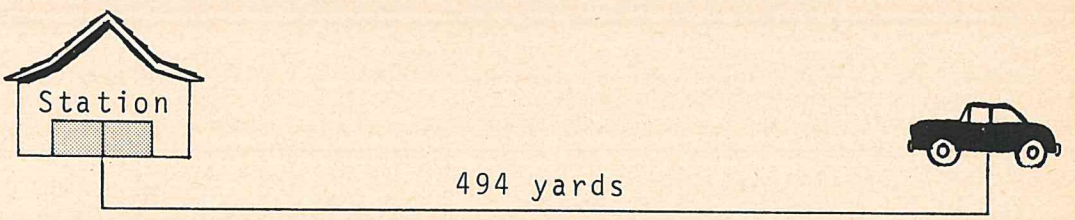


The height of this tower is _____ feet.

That is _____ yards.

494

1,482



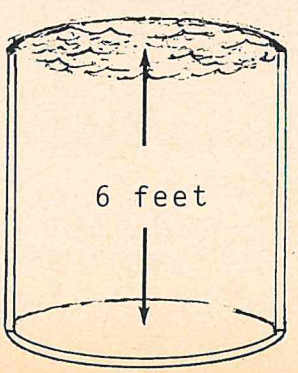
The distance from the station to the car is _____ yards.

That is _____ feet.

6

2

72



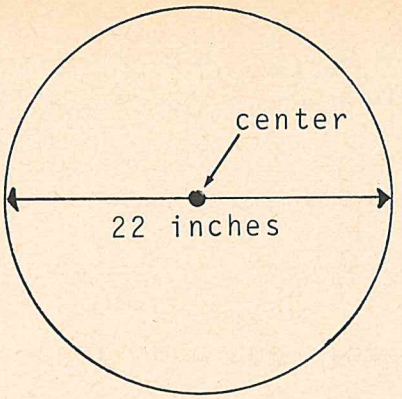
The depth of the water in the tank is ___ feet

That is ___ yards.

It is ____ inches.

22

$1\frac{5}{6}$



Here is another linear measure.

A line across the center of a circle is called the diameter.

The diameter of this circle is ____ inches.

That is ___ — feet.

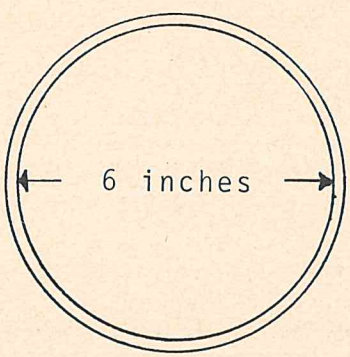
6

3

$6\frac{3}{8}$

$3\frac{3}{16}$

$\frac{3}{16}$



Here is a picture of the end of a pipe. The inside diameter of the pipe is ___ inches.

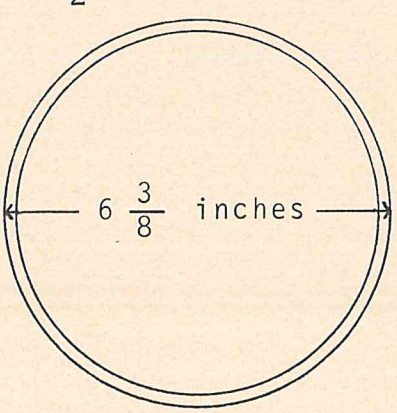
$\frac{1}{2}$ of the diameter is called the radius. The inside radius of this pipe is ___ inches.

$(\frac{1}{2} \times 6 = ?)$

The outside diameter of the pipe is ___ — inches.

The outside radius is ___ — inches.

By subtracting the inside radius from the outside radius, we can find out how thick the wall of the pipe is:



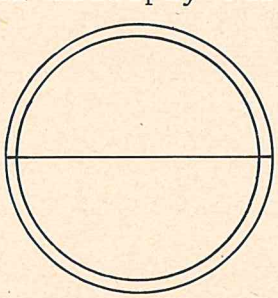
$3\frac{3}{16} - 3 =$ — inch

$\frac{1}{8}$

$\frac{1}{16}$

We can also find out how thick the wall of a pipe is by subtracting the inside diameter from the outside diameter.

We then multiply our answer by $\frac{1}{2}$.



The inside diameter of this pipe is $8\frac{3}{4}$ inches.

The outside diameter is $8\frac{7}{8}$ inches.

$8\frac{7}{8} - 8\frac{3}{4} =$

$\frac{1}{2} \times \frac{1}{8} =$ — inch, the thickness of the pipe wall.

You want to pack a table 30" high in a crate.

The crate you have measures 34" high on the outside.

The bottom of the crate is 2" thick.

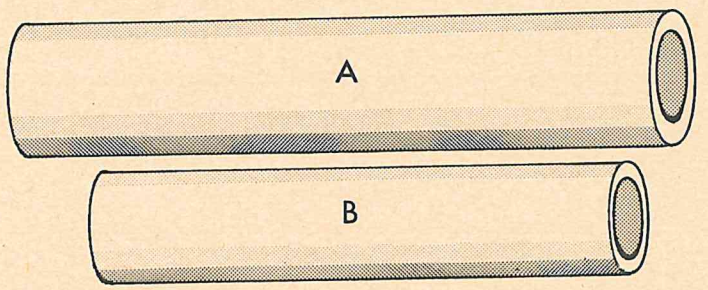
yes

Can you pack the table in the crate?

yes

no

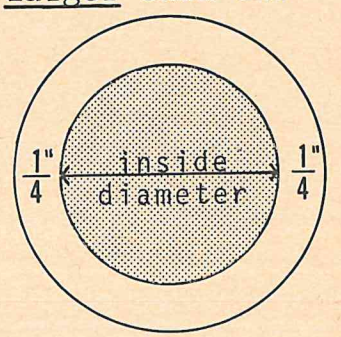
(Find the depth of the crate inside: 34" - 2" = ?)



You want to fit pipe B inside pipe A. The inside diameter of pipe A will have to be <u>larger</u> than the outside diameter of pipe B.

The outside diameter of pipe A is 5".

The wall of the pipe is $\frac{1}{4}$" inch thick.



To find the <u>inside</u> diameter of pipe A, we will have to subtract $\frac{1}{4}$" <u>twice</u> from the outside diameter: 2 x $\frac{1}{4}$ = —

$\frac{1}{2}$

5" - $\frac{1}{2}$" = ___", the inside diameter of pipe A

$4\frac{1}{2}$"

The outside diameter of pipe B is $4\frac{3}{4}$".

The inside diameter of pipe A is larger / smaller than the outside diameter of pipe B.

smaller

So pipe B will not fit inside pipe A.

Are width, depth, thickness and diameter linear measurements?

___ yes

___ no

✓ yes

FINAL EXAM

Side 1

To change inches to feet we divide by 12. or 36.

77" = ___' ___"

9' = ____"

$5\frac{5}{8}$" − $3\frac{3}{8}$"

9" − $2\frac{7}{8}$"

$7\frac{1}{4}$" − $6\frac{3}{8}$"

$5\frac{1}{2}$" − $4\frac{3}{4}$"

13' = ____"

$4\frac{1}{2}$' = ____"

8" = ___'

4' 2" + 3' 7"

15' 2" + 37' 6"

7' 3" + 8' 11"

Give the abbreviations for:

feet _____ inches _____ yards _____

---

13 feet = ___ yards ___ foot

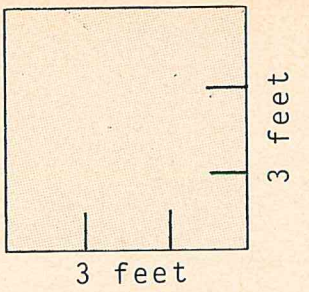
25 yards = ___ feet

5,280 feet = ___ mile

Jim drove 300 miles in 5 hours. He went ____ mph.

Turn the book over and continue with page 49.

We use linear measure to help us find <u>area</u>.

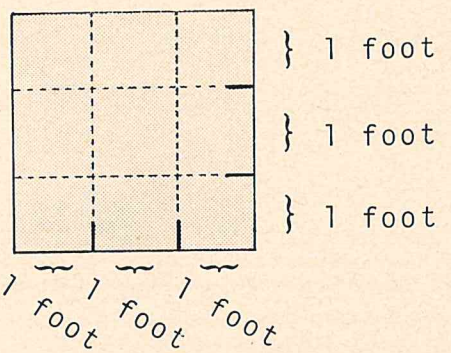


We have measured two of the sides of this square. Each side is 3 feet long.

The shaded part is the <u>area</u> of the square.

We find the area by multiplying the lengths of the two sides together: 3 x 3 = ___

9



<u>Feet</u> are used to give <u>linear</u> measurements.

But area is not a linear measure.

To give area measurements, we use <u>square feet</u>.

Look at the square now. We have extended the foot marks all the way across, from side to side and from top to bottom. The area of the square is now divided into smaller squares.

Each small square is 1 foot high and 1 foot wide.

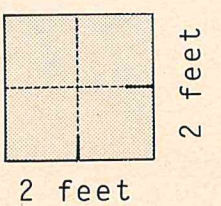
Each small square is <u>1 square foot</u> of area.

9

Count the square feet. There are ___ of them.

So 3 feet x 3 feet = 9 square feet.

Anything that has four sides -- two straight up and down and two straight across -- is a <u>rectangle</u>.



This is a square.

Is a square a rectangle?

yes

yes

no

If all four sides of a rectangle are <u>the same length</u>, the rectangle is a square.

The area of this square is:

2 feet x 2 feet = ___ square feet

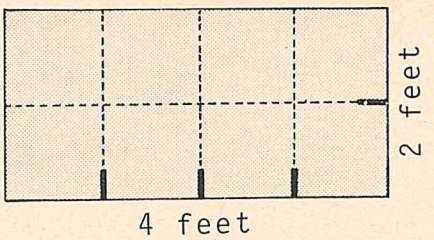
4

are not

8

yes

We can find the area of any rectangle by multiplying the length of a short side by the length of a long side.



This rectangle is not a square, because the four sides are / are not the same length.

The area of the rectangle is:

4 feet x 2 feet = ___ square feet

The rectangle is divided into square feet. Count them.

Are there 8 square feet? yes / no

12

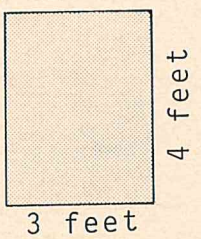
7 feet x 1 foot = 7 square feet

7 feet x 8 feet = 56 square feet

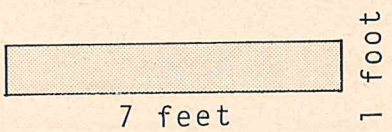
30 feet x 2 feet = 60 square feet

2 feet x 5 feet = 10 square feet

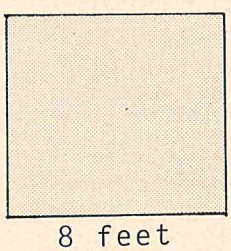
Find the area of each rectangle:



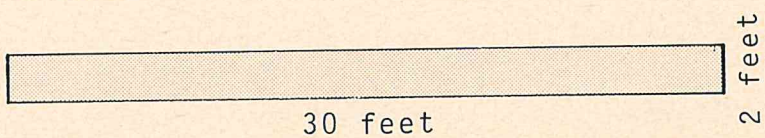
3 feet x 4 feet = ____ square feet



7 feet x ___ foot = ____ square feet



___ feet x ___ feet = ____ square feet



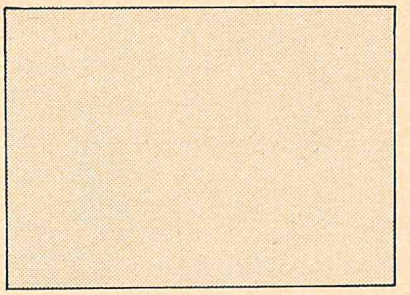
____ feet x ___ feet = ____ square feet

___ feet x ___ feet = ____ square feet

12

When we multiply feet by feet, we get square feet.

When we multiply inches by inches, we get <u>square</u> <u>inches</u>.

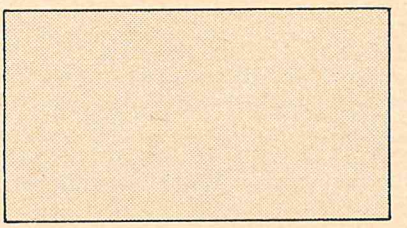


The area of this rectangle is:

4 inches x 3 inches =
____ square inches

21

When we multiply yards by yards, we get <u>square</u> <u>yards</u>.

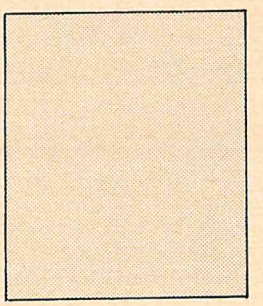


The area of this rectangle is:

6 yards x $3\frac{1}{2}$ yards =
____ square yards

20

When we multiply miles by miles, we get <u>square</u> <u>miles</u>.



The area of this rectangle is:

4 miles x 5 miles =
____ square miles

inches

70 inches x 5 inches = 350 square feet. / inches.

miles

25 miles x 4 miles = 100 square yards. / miles.

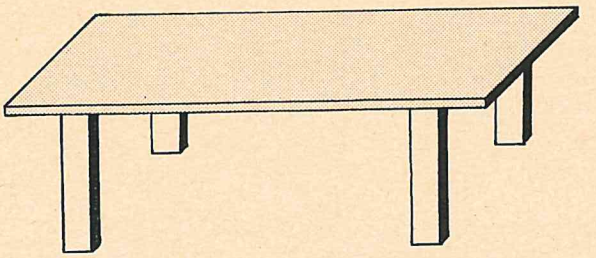
48 square yards

8 yards x 6 yards = ____ square _____.

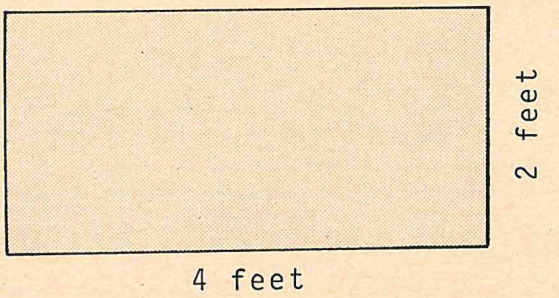
4

A rectangle has 3 / 4 sides.

Here is a table with a rectangular top:



Looking down at the top, it looks like this:



We have measured one short side and one long side of the tabletop.

yes

Now can we find its area?

no

The area is ____ square feet.

8

Glass is usually priced by the square foot.

If we wanted to buy a piece of glass to cover this tabletop, we would ask for a piece of glass "4 feet by 2 feet," so that the glass would fit the shape of the tabletop.

But when the clerk figured out how much to charge for the glass, he would multiply the <u>area</u> by the <u>price per square foot</u>.

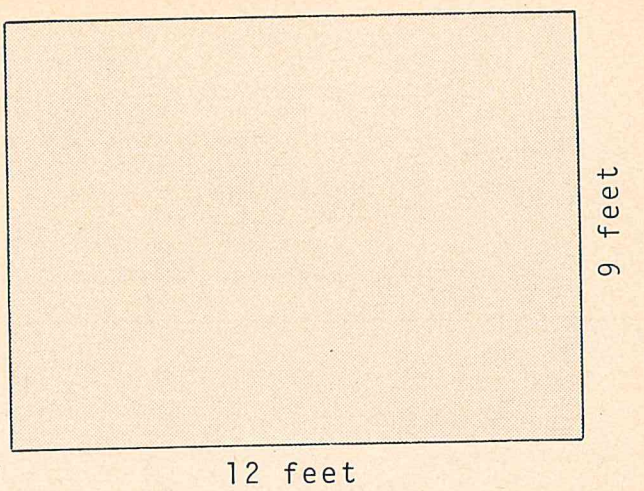
Let's say that the glass is priced at $.70 per square foot.

The area is 8 square feet, so the cost of the piece of glass will be $___.____ . ($.70 x 8 = ?)

$5.60

Many kinds of floor covering are priced by the square foot.

If a kitchen floor measures "12 feet by 9 feet," its area is _____ square feet.



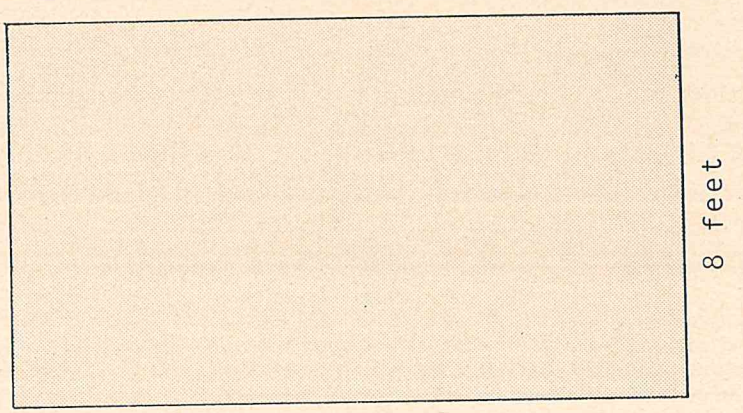
108

If linoleum sells for $.26 per square foot, this kitchen floor could be covered at a cost of $____.____ .

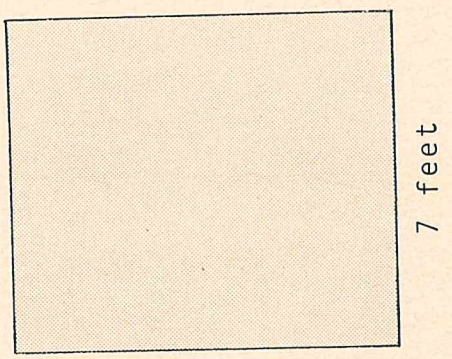
$28.08

Carpeting is also priced by the square foot.

To cover this living room floor with carpet that sells for $1.45 per square foot, you would pay $_____.____ .



$162.40



A living room has 4 walls, all of the same size.

Here is one of them.

What is its area?

____ square feet

56

To paint all 4 walls, you would have to buy enough paint to cover _____ square feet of area. (4 x 56 = ?)

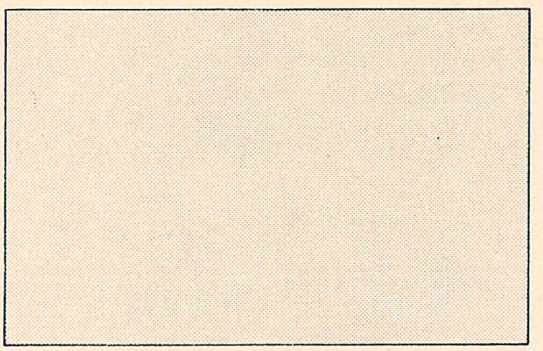
224

TEST 8

square inches

inches x inches = inches / square inches

yes



Is this a rectangle? yes / no

no

Is it a square? yes / no

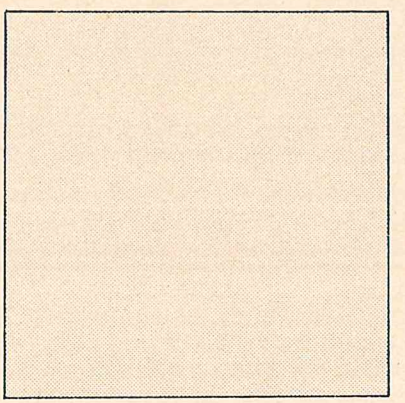
15

Its area is ____ square inches.

square feet

feet x feet = square feet / feet

yes



Is this a rectangle? yes / no

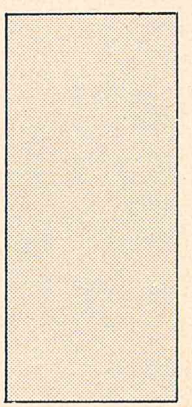
yes

Is it a square? yes / no

16

Its area is ____ square feet.

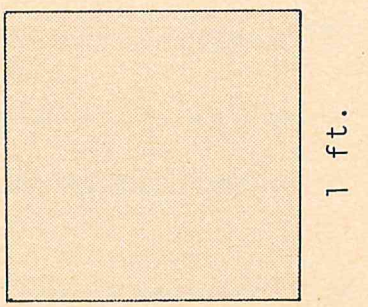
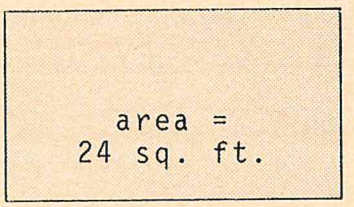
no



Is this rectangle a square? yes / no

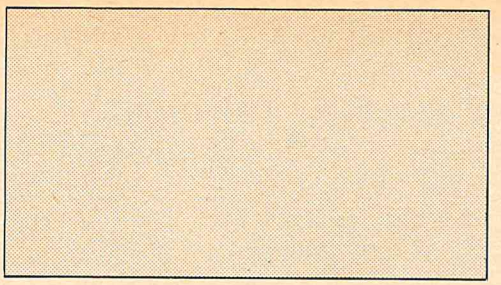
14 square yards

Its area is ____ square feet. / yards.

	The abbreviation for "square" is sq.
	12 square feet ⟶ 12 sq. ft.
76 sq. in.	76 square inches ⟶ ____ sq. in.
5 sq. yd.	5 square yards ⟶ ____ sq. _____
14 sq. mi.	14 square miles ⟶ ____ ____ _____
1 sq. ft.	 This square has an area of ___ sq. ft.
1 ft.	Each side is ___ ft. long.
12 in.	Each side is ____ in. long.
144 sq. in.	So the area in square inches is: 12 in. x 12 in. = _____ sq. in. There are 144 square inches in 1 square foot.
3,456 sq. in.	 This rectangle has an area of 24 sq. ft. That is _____ sq. in. (24 x 144 = ?)
720 sq. in.	5 sq. ft. = _____ sq. in.
1,728 sq. in.	12 sq. ft. = _____ sq. in.
360 sq. in.	$2\frac{1}{2}$ sq. ft. = _____ sq. in.

144 sq. in.

1 sq. ft.



The area of this rectangle is _____ sq. in.

That is ___ sq. ft.

2 sq. ft.

288 sq. in. = ___ sq. ft.

4 sq. ft.

576 sq. in. = ___ sq. ft.

12 sq. ft.
57 sq. in.

1,785 sq. in. = ? sq. ft.

$$144 \overline{)1{,}785} \quad 12 \text{ sq. ft.}$$
$$144$$
$$345$$
$$288$$
$$57$$

← There is a remainder of 57 sq. in.

So 1,785 sq. in. = ___ sq. ft. ___ sq. in.

$$144 \overline{)1{,}056} \quad 7$$
$$1\,008$$
$$48$$

1,056 sq. in. = ? sq. ft.

$$144 \overline{)1{,}056} \quad __ \text{ sq. ft.}$$

___ sq. in.

7 sq. ft.
48 sq. in.

So 1,056 sq. in. = ___ sq. ft. ___ sq. in.

144 sq. in.

Add:

	14 sq. ft.	93 sq. in.	
+	9 sq. ft.	51 sq. in.	
	↓	↓	
		____ sq. in.	

23 sq. ft. + 1 sq. ft.

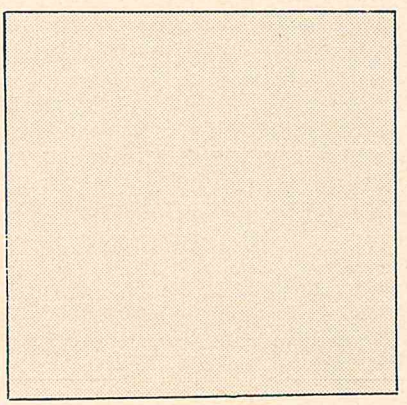
____ sq. ft. + ____ sq. ft.

24 sq. ft.

Add the square feet.

Your final answer is ____ sq. ft.

√ yes



Is the area of this rectangle 1 sq. yd.?

___ yes

___ no

Each side is 1 yd. long.

3 ft.

Each side is ___ ft.

9 sq. ft.

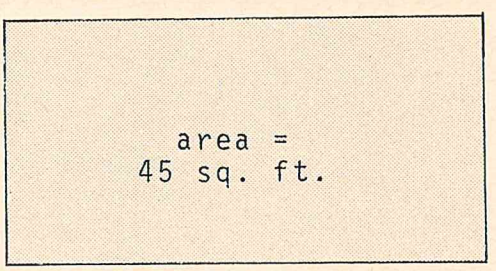
So the area in square <u>feet</u> is ___ sq. ft.
(3 x 3 = ?)

9 sq. ft.

1 sq. yd. = ___ sq. ft.

---

5 sq. yd.



The area of this rectangle is 45 sq. ft.

That is ___ sq. yd.
(45 ÷ 9 = ?)

---

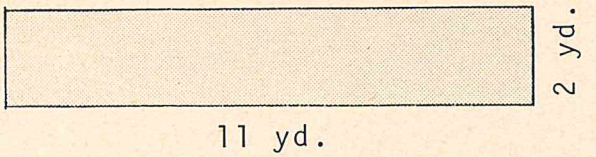
9 sq. yd.

81 sq. ft. = ___ sq. yd.

15 sq. yd.

135 sq. ft. = ____ sq. yd.

22 sq. yd.



The area of this rectangle is ____ sq. yd.

198 sq. ft.

That is _____ sq. ft. (9 x 22 = ?)

---

666 sq. ft.

74 sq. yd. = _____ sq. ft.

3,600 sq. ft.

400 sq. yd. = _____ sq. ft.

---

13 sq. yd.
19 sq. ft.
321 sq. in.

Add:

	6 sq. yd.	8 sq. ft.	120 sq. in.
	3 sq. yd.	6 sq. ft.	97 sq. in.
+	4 sq. yd.	5 sq. ft.	104 sq. in.
	___sq. yd.	____sq. ft.	_____ sq. in.

2 sq. ft.
33 sq. in.

____ sq. ft. ____ sq. in.

21 sq. ft.

Add the new sq. ft. to 19 sq. ft.: 19 + 2 = ____ sq. ft.

Now our answer looks like this:

13 sq. yd. 21 sq. ft. 33 sq. in.

2 sq. yd.
3 sq. ft.

___ sq. yd. ___ sq. ft.
(21 ÷ 9 = ? r ?)

15 sq. yd.

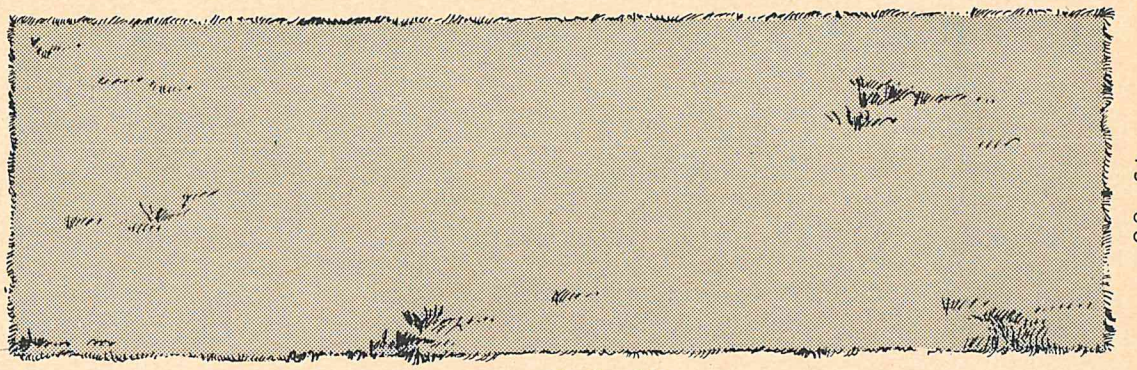
Add the new sq. yd. to 13 sq. yd.: 13 + 2 = ____ sq. yd.

15 sq. yd.
3 sq. ft.
33 sq. in.

Our final answer is:

____ sq. yd. 3 sq. ft. ____ sq. in.

A lawn needs to be re-seeded. One bag of grass seed will cover 15 sq. yd.



The area of the lawn is:

$$\begin{array}{r} 97.2 \\ \times \quad 20 \\ \hline 000 \\ \hline\hline _,___.0 \end{array}$$ sq. ft.

97.2
x 20
000
1,944
1,944
sq.ft.

Divide by 9 to find the area in square yards:

$$9 \overline{)\ 1,944}$$ sq. yd.

216 sq. yd.

A bag of grass seed covers 15 sq. yd.:

$$15 \overline{)\ 216.0}$$ bags

14.4

14.4 bags is more / less than 14 bags.

more

So it will take 14 / 15 bags of seed to re-seed the whole lawn.

15

TEST 9

144 sq. in.

_____ sq. in. = 1 sq. ft.

9 sq. ft.

___ sq. ft. = 1 sq. yd.

---

13 sq. ft.
55 sq. in.

1,927 sq. in. = ? sq. ft.

$$144 \overline{)1{,}927} \quad 13$$

$$1\ 44$$

$$487$$

$$432$$

$$55$$

Your final answer is ____ sq. ft. ___ sq. in.

---

144 sq. in.

25 sq. ft. + 1 sq. ft.

26 sq. ft.

	17 sq. ft.		97 sq. in.
+	8 sq. ft.		47 sq. in.
		↓	___ sq. in.
	___ sq. ft.	+	___ sq. ft.

Your final answer is ____ sq. ft.

---

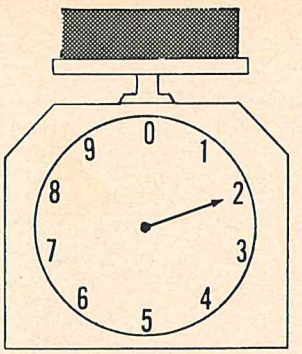
18 sq. ft.

14 sq. yd. + 2 sq. yd.

16 sq. yd.

	7 sq. yd.		7 sq. ft.
	2 sq. yd.		5 sq. ft.
+	5 sq. yd.		6 sq. ft.
		↓	___ sq. ft.
	___ sq. yd.	+	___ sq. yd.

Your final answer is ____ sq. yd.



Here is a scale with a brick on it.

We use a scale to find "how heavy" something is.

"How heavy" is called <u>weight</u>.

This scale is marked in <u>pounds</u>.

The pointer on the scale is at the number 2. This tells us that the brick weighs ___ pounds.

2

We use square inches, square feet, square yards and square miles to measure area.

We use inches, feet, yards and miles to measure

___ area.

___ length.

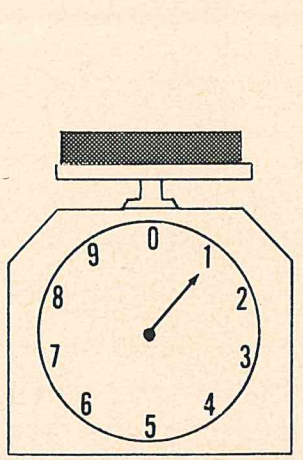
√ length

weight

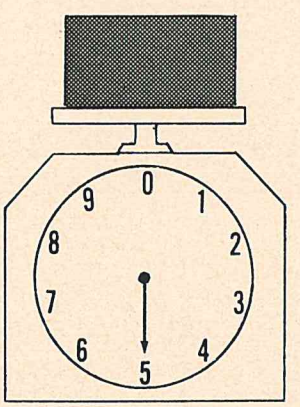
We use pounds to measure lines.

weight.

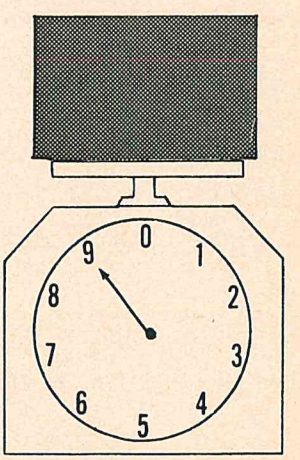
Write the weight that each scale shows:



a. ___ pound



b. ___ pounds



c. ___ pounds

a. 1 pound

b. 5 pounds

c. 9 pounds

On most scales, the pounds are divided into ounces.

There are 16 ounces in a pound.

$\frac{1}{2}$

8 ounces = $\frac{8}{16}$, or $\frac{\quad}{2}$ pound.

$\frac{4}{16}$, $\frac{1}{4}$

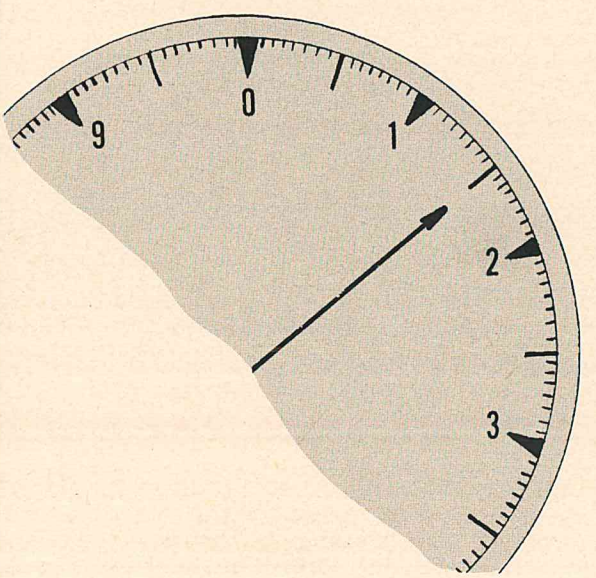
4 ounces = $\frac{\quad}{16}$, or $\frac{\quad}{\quad}$ pound

32

2 pounds = ____ ounces (2 x 16 = ?)

76

$4\frac{3}{4}$ pounds = ____ ounces



Here is part of a scale.

The pounds are divided into ounces.

The weight shown on this scale is more than 1 pound.

less

It is less / more than 2 pounds.

Count the ounces from the 1-pound mark to the mark at the end of the pointer. (Be sure to count the mark at the end of the pointer.)

8

There are ___ ounces.

The weight on this scale is 1 pound and 8 ounces,

$1\frac{1}{2}$

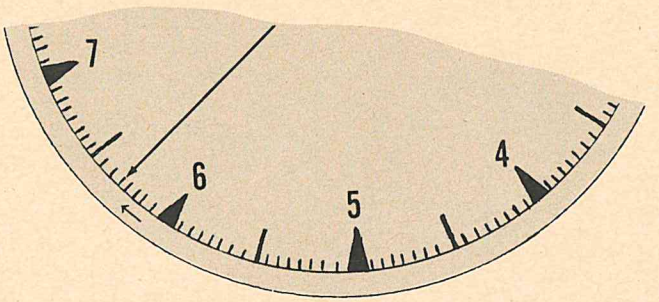
or $1\frac{\quad}{2}$ pounds.

The long mark between the numbers on the scale shows

$\frac{1}{2}$

8 ounces, or $\frac{1}{\quad}$ of a pound.

5



The weight shown on this scale is 6 pounds and ___ ounces.

(Count from the 6 in the direction of the small arrow.)

no

Can we reduce $\frac{5}{16}$? yes / no

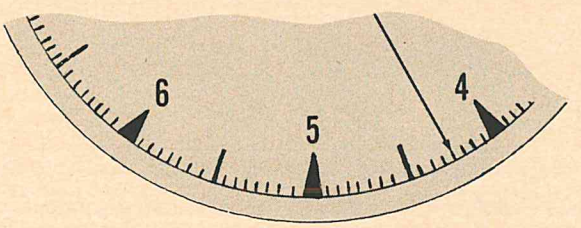
$6\ \frac{5}{16}$

So the weight is $6\ \frac{5}{16}$ pounds.

The abbreviation for "pounds" is <u>lb.</u>

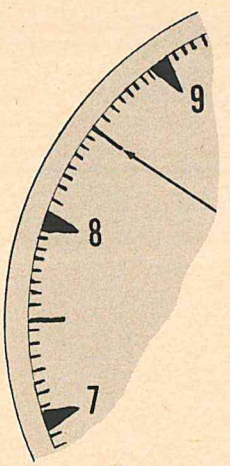
Give the weights:

$4\ \frac{1}{4}$ lb.



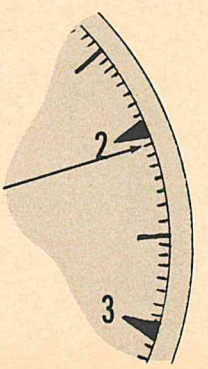
4 ___ lb. (Reduce the fraction.)

$8\ \frac{1}{2}$ lb.



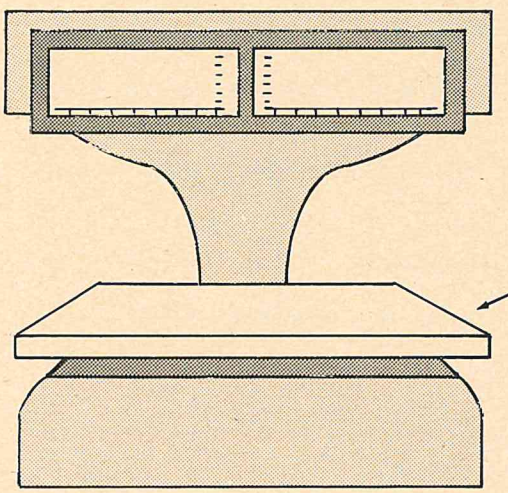
___ lb.

$2\ \frac{1}{16}$ lb.



___ lb.

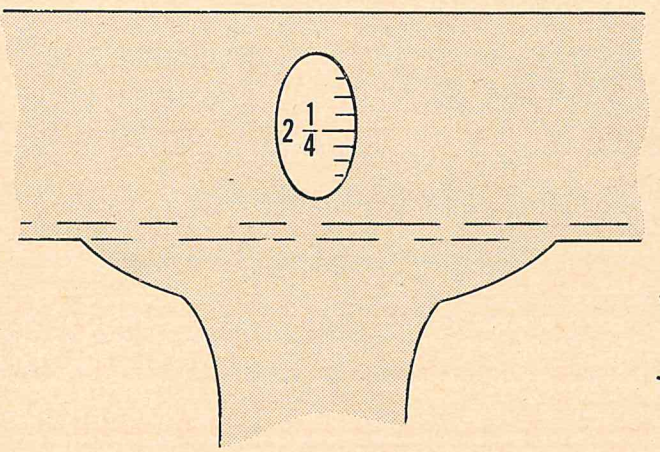
Things that are sold by weight are usually priced by the pound.



Most butchers use a scale like this to weigh meat.

The meat to be weighed is put on this tray.

This side of the scale faces the butcher. When you stand at the counter, you can't see it.



Here is the side of the scale that you <u>can</u> see. There is a small "window" where you can read the weight of the meat you are buying.

What is the weight shown here?

___ — lb.

$2\frac{1}{4}$ lb.

If the meat that is being weighed on this scale is hamburger that sells for $.40 a pound, the $2\frac{1}{4}$ lb. of it will cost $.___ .

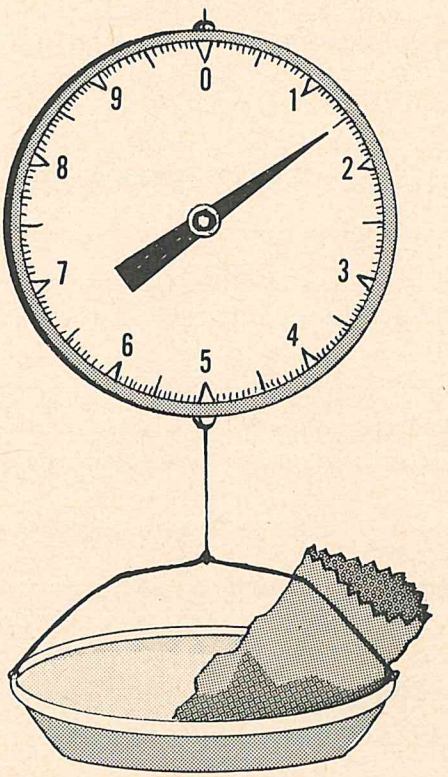
$.90

Chuck steaks sell for $.69 a pound. If you buy three steaks that weigh a total of $4\frac{1}{2}$ lb., you will pay $ _____ for them. (Round off to two places.)

$3.11

Produce (fruits and vegetables) is often sold by weight.

In a supermarket, you yourself can weigh what you are buying to see how much it will cost.



Onions are selling for $.19 a pound.

You have put a paper sack in the basket of this scale and dropped in the onions you want to buy.

The scale reads ___ — lb.

$1\frac{1}{2}$

$.29

You will pay $.____ for onions. (Round off to two places.)

$3.50

If apples are selling for $.35 a pound, 10 lb. of apples will cost $___.____ .

White potatoes are selling for $.21 a pound.

Red potatoes are selling for $.19 a pound.

$.10

5 lb. of white potatoes would cost $.____ more than 5 lb. of red potatoes.

(Find the price of 5 lb. of each kind; then subtract.)

TEST 10

We use inches, feet, yards and miles to measure

√ lines

___ lines.

___ weight.

To measure weight we use

√ b.

___ a. square inches and square feet.

___ b. pounds and ounces.

16

There are ____ ounces in a pound.

2

32 ounces = ____ pounds

64

4 pounds = ____ ounces

Check the things that are priced by the pound:

√ meat

___ carpeting

___ meat

___ glass

√ produce

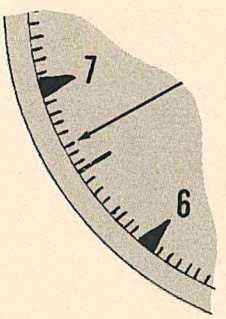
___ produce

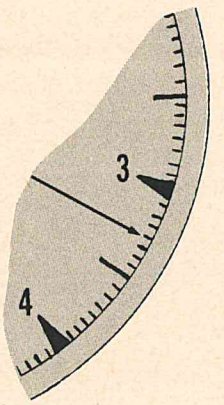
Give the weights shown: (Reduce fractions whenever possible.)

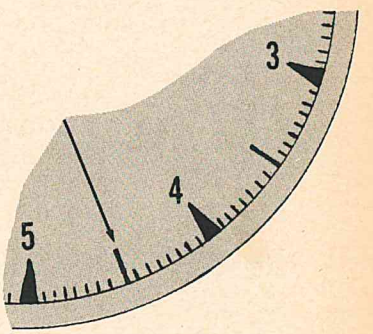
a. $6\frac{11}{16}$ lb.

b. $3\frac{1}{4}$ lb.

c. $4\frac{1}{2}$ lb.







a. ___ — lb. b. ___ — lb. c. ___ — lb.

cereal

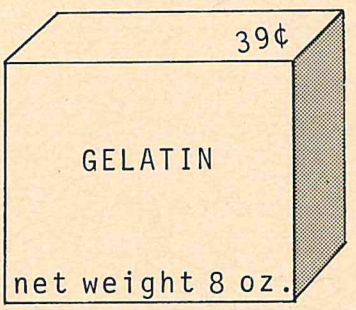
The abbreviation for "ounces" is oz.

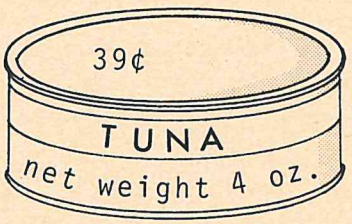
Foods that come in packages have their "net weight" (the weight of the food only, not the box or can) marked on the outside.

A box of cereal is marked "net weight 11 oz."

That means that the cereal / box weighs 11 ounces.

✓ yes





Does the can of tuna cost as much as the box of gelatin?

___ yes

___ no

gelatin

The gelatin / tuna weighs more.

$\frac{1}{2}$ lb.

Gelatin costs $.39 for $\frac{1}{2}$ lb.

$\frac{1}{4}$ lb.

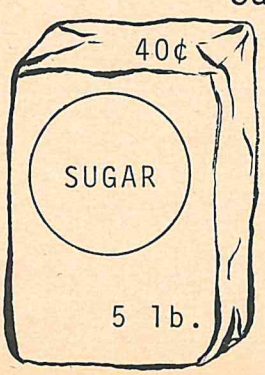
Tuna costs $.39 for $\frac{1}{4}$ lb.

---

pounds

This is 5 pounds / ounces of sugar.

$.40



5 lb. of sugar cost $.____ .

$.80

10 lb. would cost $.____ .

9 lb. 13 oz.

22 lb. 9 oz.

Add:

$$\begin{array}{r} 4 \text{ lb.} \quad 5 \text{ oz.} \\ +\ 5 \text{ lb.} \quad 8 \text{ oz.} \\ \hline __ \text{ lb.} \quad __ \text{ oz.} \end{array}$$

$$\begin{array}{r} 17 \text{ lb.} \quad 7 \text{ oz.} \\ +\ 5 \text{ lb.} \quad 2 \text{ oz.} \\ \hline __ \text{ lb.} \quad __ \text{ oz.} \end{array}$$

16 oz.

5 lb. + 1 lb.

6 lb.

32 oz.

18 lb. + 2 lb.

20 lb.

$$\begin{array}{r} 2 \text{ lb.} \quad 8 \text{ oz.} \\ +\ 3 \text{ lb.} \quad 8 \text{ oz.} \\ \hline \downarrow \qquad __ \text{ oz.} \\ \qquad\quad \uparrow \\ __ \text{ lb.} + __ \text{ lb.} \\ \downarrow \\ __ \text{ lb.} \end{array}$$

$$\begin{array}{r} 7 \text{ lb.} \quad 14 \text{ oz.} \\ 6 \text{ lb.} \quad 10 \text{ oz.} \\ +\ 5 \text{ lb.} \quad 8 \text{ oz.} \\ \hline \downarrow \qquad __ \text{ oz.} \\ \qquad\quad \uparrow \\ __ \text{ lb.} + __ \text{ lb.} \\ \downarrow \\ __ \text{ lb.} \end{array}$$

12 lb. 20 oz.

1 lb. 4 oz.

13 lb. 4 oz.,

$13\frac{1}{4}$ lb.

$$\begin{array}{r} 5 \text{ lb.} \quad 12 \text{ oz.} \\ +\ 7 \text{ lb.} \quad 8 \text{ oz.} \\ \hline __ \text{ lb.} \quad __ \text{ oz.} \\ \qquad\quad \downarrow \\ __ \text{ lb.} \quad __ \text{ oz.} \end{array} \qquad (20 \div 16 = ? \text{ r } ?)$$

$$__ \text{ lb.} \quad __ \text{ oz., or } __ \frac{__}{4} \text{ lb.}$$

110 lb. 9 oz.

8 lb. 7 oz.

Subtract:

$$\begin{array}{r} 140 \text{ lb.} \quad 12 \text{ oz.} \\ -\ 30 \text{ lb.} \quad 3 \text{ oz.} \\ \hline ___ \text{ lb.} \quad ___ \text{ oz.} \end{array} \qquad \begin{array}{r} 17 \text{ lb.} \quad 15 \text{ oz.} \\ -\ 9 \text{ lb.} \quad 8 \text{ oz.} \\ \hline __ \text{ lb.} \quad __ \text{ oz.} \end{array}$$

---

no

16 oz.

3 lb. 13 oz.

$$\begin{array}{r} 6 \text{ lb.} \quad 7 \text{ oz.} \\ -\ 2 \text{ lb.} \quad 10 \text{ oz.} \\ \hline ? \end{array}$$

Can we subtract 10 from 7? yes / no

We borrow 1 lb., or ____ oz., from the 6 lb.

Then we add the 16 oz. to 7 oz.

so $\begin{array}{r} 6 \text{ lb.} \quad 7 \text{ oz.} \\ -\ 2 \text{ lb.} \quad 10 \text{ oz.} \\ \hline ? \end{array}$ $\longrightarrow$ $\begin{array}{r} {\scriptstyle 5} \\ \cancel{6} \text{ lb.} \quad 23 \text{ oz.} \\ -\ 2 \text{ lb.} \quad 10 \text{ oz.} \\ \hline __ \text{ lb.} \quad __ \text{ oz.} \end{array}$

$\begin{array}{r} {\scriptstyle 6} \\ \cancel{7} \text{ lb. } 25 \text{ oz.} \\ -\ 4 \text{ lb. } 11 \text{ oz.} \\ \hline 2 \text{ lb. } 14 \text{ oz.} \end{array}$

$\begin{array}{r} 7 \text{ lb.} \quad 9 \text{ oz.} \\ -\ 4 \text{ lb.} \quad 11 \text{ oz.} \\ \hline ? \end{array}$ $\longrightarrow$ $\begin{array}{r} {\scriptstyle 6} \\ \cancel{7} \text{ lb.} \quad __ \text{ oz.} \\ -\ 4 \text{ lb.} \quad 11 \text{ oz.} \\ \hline __ \text{ lb.} \quad __ \text{ oz.} \end{array}$

---

9 lb. 10 oz.

$$\begin{array}{r} 12 \text{ lb.} \quad 5 \text{ oz.} \\ -\ 2 \text{ lb.} \quad 11 \text{ oz.} \\ \hline ? \end{array} \longrightarrow$$

Letters are weighed in ounces to find the mailing cost.

A 6-cent stamp will mail a 1-ounce letter.

12 cents

It costs ____ cents to mail a 2-ounce letter.

18 cents

It costs ____ cents to mail a 3-ounce letter.

Regular mail costs $.06 an ounce, but "air mail" costs $.10 an ounce.

To mail a 1-ounce air mail letter, we need a 10-cent stamp.

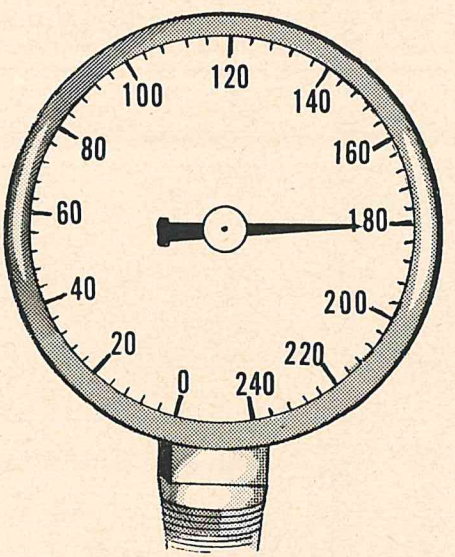
20

To mail a 2-ounce air mail letter, we need ____ cents' worth of stamps.

30

To mail a 3-ounce air mail letter, we need ____ cents' worth of stamps.

Pressure is shown in pounds on a pressure gauge.



This pressure gauge shows the pressure in a boiler.

The pressure in this boiler should be kept below 200 pounds.

The pressure shown on the gauge is _____ pounds.

180

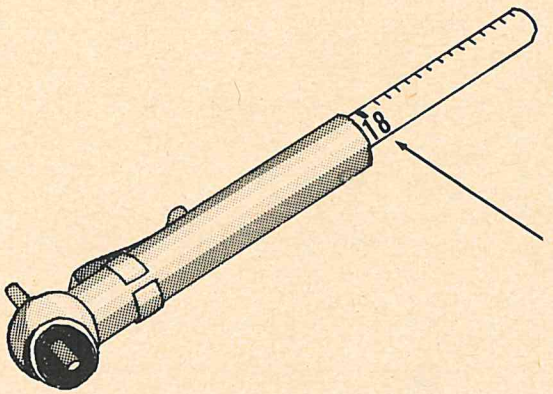
yes

no

Is the pressure in the boiler too high?

no

The air pressure in the tires on cars is also measured in pounds.



This is a tire gauge.

The air pressure shown on this gauge is ____ pounds.

18

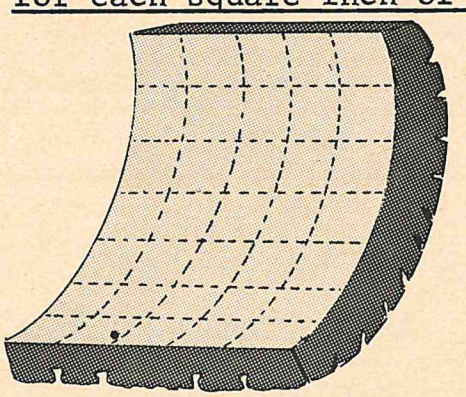
Let's say that the tires on your car are supposed to "carry" 25 pounds of pressure.

You check one of the tires with a gauge. It shows 22 pounds.

You will { add / take out } 3 pounds of air.

add

<u>Pressure</u> is a measurement of <u>force</u>. When we say that the air pressure in a tire is 25 pounds, we mean that the air in the tire is pushing against the wall of the tire with a force of <u>25 pounds for each square inch of area</u>.



Here is a piece of the inside wall of a tire, divided into square inches.

If the air in the tire is pushing on each square inch with a force of 30 pounds, we say that the air pressure is ____ lb.

30 lb.

<u>Weight</u> is also a measurement of force. When a man weighs himself on a scale and says that he weighs 180 pounds, he is saying that he is pushing down on the scale with a force of _____ pounds.

180

TEST 11

Give the abbreviation for:

pounds _____

ounces _____

---

14 lb. 22 oz.

1 lb. 6 oz.

15 lb. 6 oz.

16 oz.

8 lb. + 1 lb.

9 lb.

$$\begin{array}{r} 7 \text{ lb.} \quad 12 \text{ oz.} \\ +\ 7 \text{ lb.} \quad 10 \text{ oz.} \\ \hline \end{array}$$

___ lb. ___ oz.

___ lb. ___ oz.

___ lb. ___ oz.

$$\begin{array}{r} 5 \text{ lb.} \quad 7 \text{ oz.} \\ +\ 3 \text{ lb.} \quad 9 \text{ oz.} \\ \hline \end{array}$$

___ oz.

___ lb. + ___ lb.

___ lb.

---

75 lb. 7 oz.

$$\begin{array}{r} 125 \text{ lb.} \quad 13 \text{ oz.} \\ -\ 50 \text{ lb.} \quad 6 \text{ oz.} \\ \hline \end{array}$$

___ lb. ___ oz.

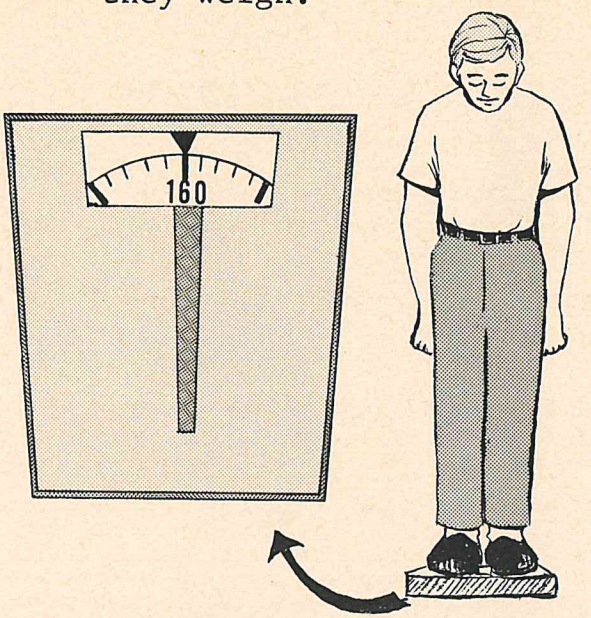
---

7 lb. 15 oz.

$$\begin{array}{r} 13 \text{ lb.} \quad 7 \text{ oz.} \\ -\ 5 \text{ lb.} \quad 8 \text{ oz.} \\ \hline \end{array}$$

?

People have weight. Most people know about how much they weigh.



This man is standing on a bathroom scale.

160 lb.

The scale shows his weight to be _____ lb.

This girl is standing on a doctor's scale.

130 lb.

The scale shows that she weighs _____ lb.

Doctors know that your weight is important to your health. A doctor can tell you how much you should weigh.

If you weigh more than you should, you are <u>overweight</u>.

underweight

If you weigh less than you should, you are overweight. / underweight.

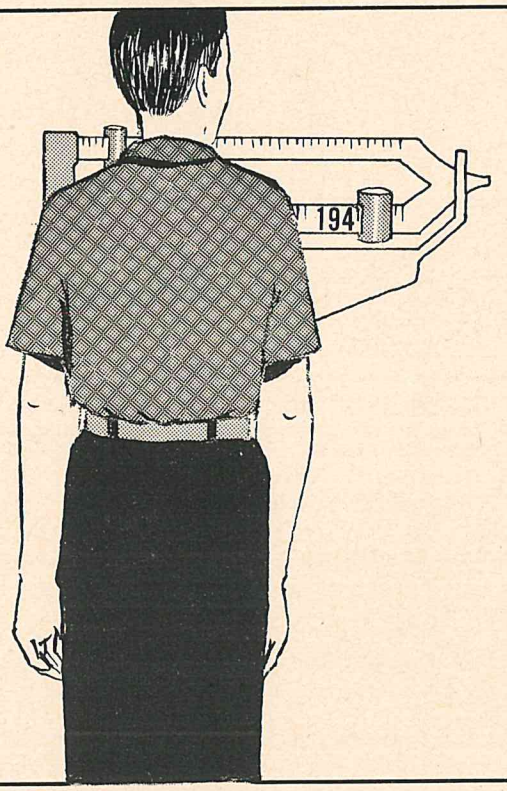
15

If you should weigh 170 pounds, but you weigh 185 pounds, you are ____ pounds overweight.

17

If you should weigh 192 pounds, but you weigh 175 pounds, you are ____ pounds underweight.

overweight



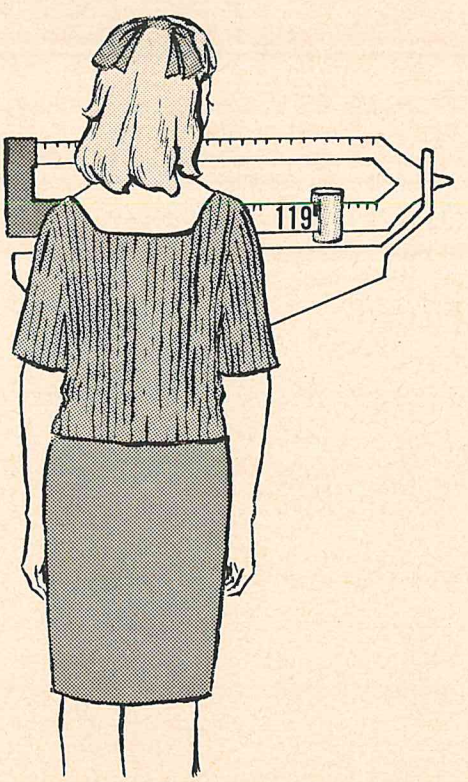
This man should weigh 185 pounds.

He is overweight. / underweight.

9

He weighs ___ pounds more than he should.

no



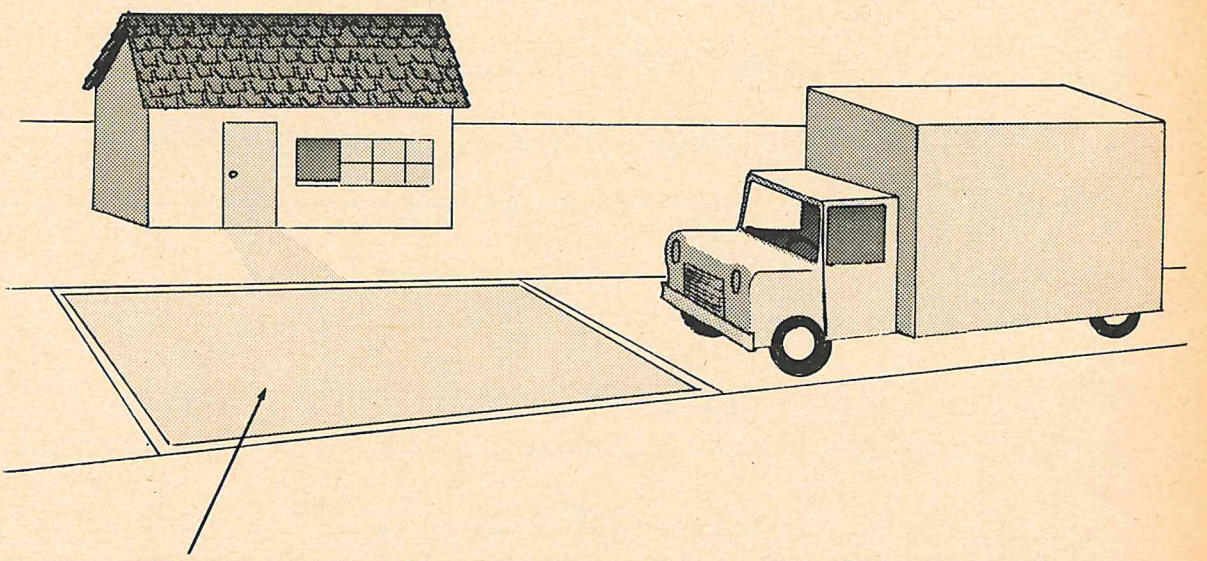
This girl should weigh 125 pounds.

Is she overweight? yes / no

6

She is ___ pounds underweight.

This is a weighing station for trucks.



This is a platform scale. The truck drives onto the platform to be weighed.

Trucks are weighed in <u>tons</u> (2,000 lb.) and <u>hundred-weight</u> (100 lb.).

The abbreviation for "ton" is <u>T.</u>

The abbreviation for "hundred-weight" is <u>cwt.</u>

14,500 lb.

If the truck in the picture weighs 7 T. 5 cwt., it weighs a total of _____ lb.
(7 x 2,000 = ?; 5 x 100 = ?; add your answers.)

2,000 lb.

1 T. = _____ lb.

8,000 lb.

4 T. = _____ lb.

13,000 lb.

$6\frac{1}{2}$ T. = _____ lb.

---

100 lb.

1 cwt. = _____ lb.

700 lb.

7 cwt. = _____ lb.

2,000 lb., 1 T.

20 cwt. = _____ lb., or ____ T.

unsafe

If a truck is overweight because it is overloaded for its size, the weighing station will make the driver re-load the truck; and the trucking company will have to pay a fine.

An overloaded truck is probably safe / unsafe to drive.

---

4 T.

Your truck weighs 3 T. 5 cwt. empty. It is built to carry an additional 4 T. of load.

As you are driving your loaded truck, you come to a weighing station.

The gross weight (the total weight of the truck and its load) of the truck is 7 T. 5 cwt.

Your load weighs:

	7 T.	5 cwt.	(gross weight)
-	3 T.	5 cwt.	(weight of truck empty)
	___T.	0 cwt.	(weight of load)

---

yes

Is your truck safe with that load? yes / no

√ no

Many highways have a weight limit, because too much weight would damage the surface of the road.

Should you drive a 14-T. truck on a highway with a 12-T. weight limit?

___ yes

___ no

---

2 T.

Your truck would be ___ T. overweight for the road.

7 T. 4 cwt.

200 lb.

8 T. 2 cwt.

Add:

$$\begin{array}{r} 2\text{ T.}\quad 3\text{ cwt.} \\ +\ 5\text{ T.}\quad 1\text{ cwt.} \\ \hline __\text{ T.}\quad __\text{ cwt.} \end{array}$$

$$\begin{array}{r} 1\text{ T.}\quad 97\text{ lb.} \\ +\ 7\text{ T.}\quad 103\text{ lb.} \\ \hline ____\text{ lb.} \\ __\text{ T.}\quad ____\text{ cwt.} \end{array}$$

2,000 lb., 1 T.

7 T. 21 cwt.

1 T. 1 cwt.

8 T. 1 cwt.

20 cwt. = _____ lb., or ___ T.

Add:

$$\begin{array}{r} 3\text{ T.}\quad 11\text{ cwt.} \\ +\ 4\text{ T.}\quad 10\text{ cwt.} \\ \hline __\text{ T.}\quad ___\text{ cwt.} \\ ___\text{ T.}\quad ___\text{ cwt.} \\ __\text{ T.}\quad ___\text{ cwt.} \end{array}$$

(21 ÷ 20 = ? r ?)

no

20 cwt.

3
~~4~~ T. 29 cwt.
- 1 T. 11 cwt.
2 T. 18 cwt.

Subtract:

$$\begin{array}{r} 4\text{ T.}\quad 9\text{ cwt.} \\ -\ 1\text{ T.}\quad 11\text{ cwt.} \\ \hline ? \end{array}$$

Can we subtract 11 from 9? yes / no

We borrow 1 T., or ____ cwt.

We add the 20 cwt. to the 9 cwt.

so

$$\begin{array}{r} 3 \\ \text{~~4~~ T.}\quad ___\text{ cwt.} \\ -\ 1\text{ T.}\quad 11\text{ cwt.} \\ \hline __\text{ T.}\quad ___\text{ cwt.} \end{array}$$

(20 + 9 = ?)

yes

TEST 12

Is your weight important to your health? yes / no

If you weigh less than you should, you are

√ underweight

___ overweight.

___ underweight.

T.

cwt.

Give the abbreviations for:

tons _____

hundred-weight _____

---

100 lb.

1 T.

2,000 lb.

1 cwt. = _____ lb.

20 cwt. = ___ T.

1 T. = _____ lb.

---

300 lb.

16 T. 3 cwt.

$$\begin{array}{rrr} & 4\text{ T.} & 99\text{ lb.} \\ & 5\text{ T.} & 88\text{ lb.} \\ + & 7\text{ T.} & 113\text{ lb.} \\ \hline \end{array}$$

_____lb.

↓

___T. ___cwt.

---

1 T. 12 cwt.

(Borrow 1 T., or 20 cwt.)

$$\begin{array}{rrr} & 5\text{ T.} & 8\text{ cwt.} \\ - & 3\text{ T.} & 16\text{ cwt.} \\ \hline & ? & \end{array} \longrightarrow$$

yes

Liquids are things we can pour.

Is water a liquid? yes / no

Check the liquids:

✓ orange juice

___ orange juice

___ apples

___ oats

✓ lemonade

___ lemonade

✓ milk

___ milk

___ bread

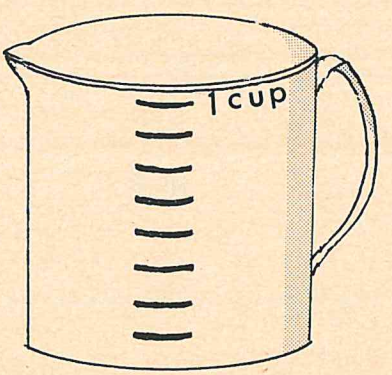
yes

Liquids can also be called fluids.

Are water, orange juice, lemonade and milk fluids? yes / no

We measure liquids in fluid ounces.

This is a measuring cup:



Each line on the cup marks 1 fluid ounce.

Count the lines.

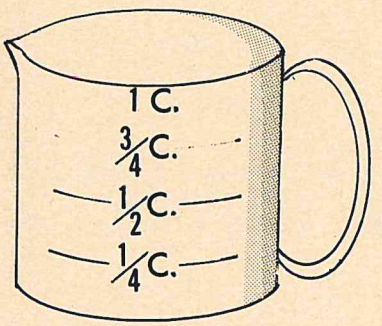
There are ___ fluid ounces in 1 cup.

√ ounces

The abbreviation for "cup" is C.

We can use fl. oz. as an abbreviation for fluid ___ ounces.

___ pounds.



Most measuring cups are marked in cups and fractions of cups, instead of in fluid ounces.

8 fl. oz.

1 C. = ___ fl. oz.

6 fl. oz.

$\frac{3}{4}$ C. = ___ fl. oz.

4 fl. oz.

$\frac{1}{2}$ C. = ___ fl. oz.

2 fl. oz.

$\frac{1}{4}$ C. = ___ fl. oz.

7 C.
7 fl. oz.,
$7\frac{7}{8}$ C.

Add:

$$\begin{array}{rrr} & 4 \text{ C.} & 6 \text{ fl. oz.} \\ + & 3 \text{ C.} & 1 \text{ fl. oz.} \\ \hline & __ \text{C.} & __ \text{fl. oz., or } __\ \frac{_}{8} \text{ C.} \end{array}$$

10 C.
9 fl. oz.

1 C.
1 fl. oz.

11 C.
1 fl. oz.,
$11\frac{1}{8}$ C.

$$\begin{array}{rrr} & 1 \text{ C.} & 4 \text{ fl. oz.} \\ & 3 \text{ C.} & 3 \text{ fl. oz.} \\ + & 6 \text{ C.} & 2 \text{ fl. oz.} \\ \hline & __ \text{C.} & __ \text{fl. oz.} \\ & \downarrow & \\ & __ \text{C.} & __ \text{fl. oz.} \end{array} \quad (9 \div 8 = ? \text{ r } ?)$$

$$\downarrow$$

___C. ___fl. oz., or ___ $\frac{_}{8}$ C.

Subtract:

8 C.	4 fl. oz.
- 3 C.	5 fl. oz.
	?

Can we subtract 5 from 4?

yes / no

We borrow 1 cup from the 8 cups.

1 C. = ___ fl. oz.

8 fl. oz.

We add this to the 4 fluid ounces, for a total of ____ fluid ounces.

12

~~8~~ 7 C.	12 fl. oz.
3 C.	5 fl. oz.
___C.	___fl. oz., or ___ $\frac{}{8}$ C.

4 C. 7 fl. oz., $4\frac{7}{8}$ C.

There are ___ cups in 1 pint.

2

1 pint = ___ fluid ounces

16

$\frac{1}{2}$ pint = ___ fluid ounces

8

$\frac{1}{2}$ pint = 1 cup / 2 cups

1 cup

Fluid ounces are used in liquid measure.

Are cups and pints also used in liquid measure? yes / no

yes

A pint is more / less than a cup.

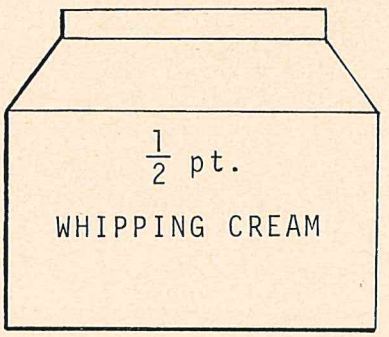
more

1 C.

The abbreviation for "pint" is pt.

$\frac{1}{2}$ pt. = ___ C.

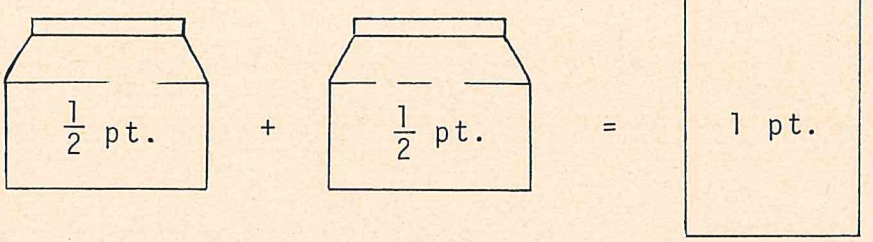
8 fl. oz.



We usually buy whipping cream in pints or $\frac{1}{2}$ pints.

$\frac{1}{2}$ pt. of whipping cream = ___ fl. oz. of whipping cream

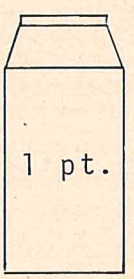
1



The cardboard cartons that hold $\frac{1}{2}$ pt. of whipping cream are called "half-pints."

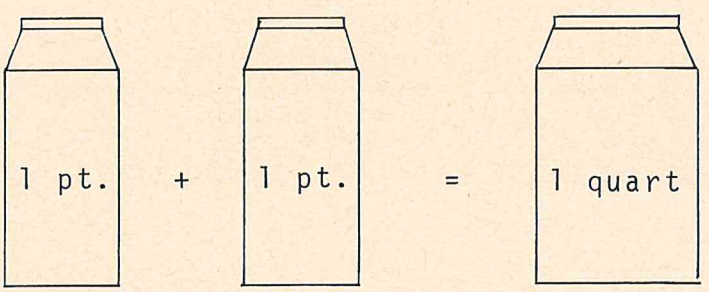
2 half-pints = ___ pint

16 fl. oz.



= ___ fl. oz.

32 fl. oz.



= ___ fl. oz.

1 quart = 32 fl. oz.

4 C.

1 quart = ___ C. (32 ÷ 8 = ?)

1 C.

$\frac{1}{2}$ pt. = ___ C.

2 C.

1 pt. = ___ C.

4 C.

2 pt. = ___ C.

The abbreviation for "quart" is qt.

4 C.

1 qt. = ___ C.

16 fl. oz.

Add:

$$\begin{array}{r} 3\text{ C.}\quad 4\text{ fl. oz.} \\ 2\text{ C.}\quad 7\text{ fl. oz.} \\ +\ 1\text{ C.}\quad 5\text{ fl. oz.} \\ \hline \quad\quad __\text{fl. oz.} \end{array}$$

6 C. + 2 C. = 8 C.

___C. + ___C. = ___C.

2 qt.

___ qt. (8 ÷ 4 = ?)

2 pt.

Add:

$$\begin{array}{r} 1\text{ qt.}\quad 1\text{ pt.} \\ +\ 2\text{ qt.}\quad 1\text{ pt.} \\ \hline \quad\quad __\text{pt.} \end{array}$$

3 qt. + 1 qt. = 4 qt.

___qt. + ___qt. = ___ qt.

TEST 13

8 fl. oz.

1 C. = ___ fl. oz.

2 C.

1 pt. = ___ C.

16 fl. oz.

1 pt. = ___ fl. oz.

4 C.

1 qt. = ___ C.

32 fl. oz.

1 qt. = ___ fl. oz.

16 fl. oz.

	3 C.	3 fl. oz.
	3 C.	6 fl. oz.
+	4 C.	7 fl. oz.
		___ fl. oz.

10 C. + 2 C. = 12 C.

___C. + ___C. = ___C.

3 qt.

___qt.

4 pt.

	1 qt.	3 pt.
+	5 qt.	1 pt.
		___ pt.

6 qt. + 2 qt. = 8 qt.

___qt. + ___qt. = ___qt.

16 fl. oz.

13 qt. 1 pt.,
13 $\frac{1}{2}$ qt.

Add:

$$\begin{array}{rrr} & 6 \text{ qt.} & 7 \text{ fl. oz.} \\ + & 7 \text{ qt.} & 9 \text{ fl. oz.} \\ \hline & __ \text{ qt.} & __ \text{ fl. oz.} \end{array}$$

__ qt. __ pt., or __ $\frac{_}{2}$ qt.

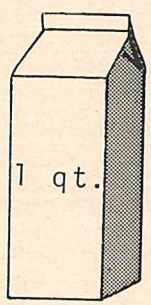
3 $\frac{1}{2}$ qt.

Subtract:

$$\begin{array}{rrr} & \cancel{8}^{\,7} \text{ qt.} & 2 \text{ pt.} \\ - & 4 \text{ qt.} & 1 \text{ pt.} \\ \hline & 3 \text{ qt.} & 1 \text{ pt.} \end{array}$$

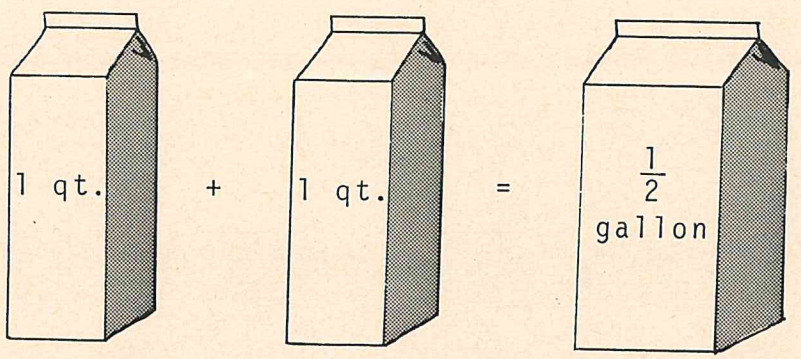
$$\begin{array}{rrr} & 8 \text{ qt.} & \\ - & 4 \text{ qt.} & 1 \text{ pt.} \\ \hline & ? & \end{array} \longrightarrow \begin{array}{rrr} & \cancel{8}^{\,7} \text{ qt.} & __ \text{ pt.} \\ - & 4 \text{ qt.} & 1 \text{ pt.} \\ \hline & __ \text{ qt.} & __ \text{ pt., or } __ \text{ qt.} \end{array}$$

32 fl. oz.



= ____ fl. oz.

64 fl. oz.



= ____ fl. oz.

128 fl. oz.

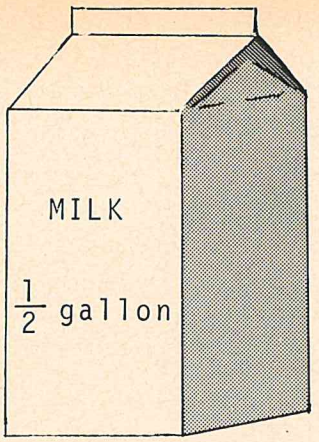
$\frac{1}{2}$ gallon = 64 fl. oz.

1 gallon = _____ fl. oz. (2 x 64 = ?)

2 qt.

4 qt.

2 half-gallons, 4 quarts



The abbreviation for "gallon" is gal.

$\frac{1}{2}$ gal. = ___ qt.

1 gal. = ___ qt.

The cardboard cartons that hold $\frac{1}{2}$ gal. are called "half-gallons."

If you wanted to buy a gallon of milk, you could buy ___ half-gallons, or ___ quarts.

4

4

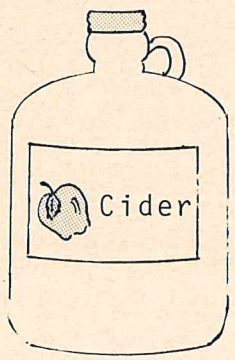
16

60

$3\frac{3}{4}$

4

Things like apple cider and wine are often sold in gallon jugs.



There are ___ quarts in 1 gallon.

There are ___ cups in 1 quart.

So there are ____ cups in 1 gallon. (4 x 4 = ?)

If you were going to have 20 people for a party, and you wanted to count on each person's having 3 cups of cider, you would have to buy enough cider to get ____ cups.

That is ___ — gallons of cider. (60 ÷ 16 = ?; reduce the fraction.)

You would have to buy $\begin{matrix}3\\4\end{matrix}$ gallons of cider to have enough.

The gasoline John puts in his car sells for $.31 a gallon.

John asks the filling station attendant to fill up the gas tank in his car.

John pays $2.79 for the amount of gas it takes to fill his tank.

How many gallons of gasoline did he get?
____ (Divide.)

9

Mrs. Bruce is making jam. She has 6 gallons of jam to put into 1-quart jars.

How many jars will she fill? ____
(There are 4 quarts in 1 gallon, so there are 4 x 6 quarts in 6 gallons.)

24

10 gal. 5 qt.

1 gal. 1 qt.

11 gal. 1 qt.

$$\begin{array}{r} 4 \text{ gal. } 3 \text{ qt.} \\ + \; 6 \text{ gal. } 2 \text{ qt.} \\ \hline __ \text{ gal. } __ \text{ qt.} \end{array} \longleftarrow$$

This is ___ gal. ___ qt.

So your final answer is ___ gal. ___ qt.

6 qt.

7 gal. +
1 gal. 2 qt. =
8 gal. 2 qt.,
$8\frac{1}{2}$ gal.

Add:

$$\begin{array}{r} 5 \text{ gal.} \quad 3 \text{ qt.} \\ +\ 2 \text{ gal.} \quad 3 \text{ qt.} \\ \hline \quad\quad\quad\ __ \text{ qt.} \end{array}$$

__ gal. + __ gal. __ qt. = __ gal. __ qt.,

or __ $\frac{}{2}$ gal.

5 qt.

11 gal. +
1 gal. 1 qt. =
12 gal. 1 qt.,
$12\frac{1}{4}$ gal.

$$\begin{array}{r} 7 \text{ gal.} \quad 3 \text{ qt.} \\ +\ 4 \text{ gal.} \quad 2 \text{ qt.} \\ \hline \quad\quad\quad\ __ \text{ qt.} \end{array}$$

__ gal. + __ gal. __ qt. = __ gal. __ qt.,

or __ — gal.

3 pt.

7 qt. +
1 qt. 1 pt. =
8 qt. 1 pt.

2 gal. 1 pt.

11 gal. +
2 gal. 1 pt. =
13 gal. 1 pt.,
$13\frac{1}{8}$ gal.

$$\begin{array}{r} 5 \text{ gal.} \quad 3 \text{ qt.} \quad 1 \text{ pt.} \\ 2 \text{ gal.} \quad 1 \text{ qt.} \quad 1 \text{ pt.} \\ +\ 4 \text{ gal.} \quad 3 \text{ qt.} \quad 1 \text{ pt.} \\ \hline \quad\quad\quad\quad\quad\ __ \text{ pt.} \end{array}$$

(Start by adding pints.)

__ qt. + __ qt. __ pt. = __ qt. __ pt.

__ gal. __ pt.

__ gal. + 2 gal. 1 pt. = __ gal. 1 pt.,

or __ $\frac{}{8}$ gal.

Subtract:

$$\begin{array}{r} 1 \text{ gal.} \quad 1 \text{ qt.} \\ - \quad\quad\quad 3 \text{ qt.} \\ \hline ? \end{array}$$

4

You will have to borrow the gallon (___ quarts) and add the quarts to the 1 quart you already have.

0
~~1~~ gal. 5 qt.
3 qt.
2 qt.,
$\frac{1}{2}$ gal.

$$\begin{array}{r} {\scriptstyle 0} \\ {\scriptstyle \cancel{1}} \text{ gal.} \quad ___ \text{ qt.} \\ - \quad\quad\quad 3 \text{ qt.} \\ \hline __ \text{qt., or } \frac{1}{__} \text{ gal.} \end{array}$$

Subtract: (You will have to borrow.)

1 gal. 3 qt.

$$\begin{array}{r} 7 \text{ gal.} \quad 2 \text{ qt.} \\ - \quad 5 \text{ gal.} \quad 3 \text{ qt.} \\ \hline ? \end{array} \longrightarrow$$

$1\frac{3}{4}$ gal.

(This is ___ — gal.)

3 qt.

$$\begin{array}{r} 3 \text{ gal.} \quad 1 \text{ qt.} \\ - \quad 2 \text{ gal.} \quad 2 \text{ qt.} \\ \hline ? \end{array} \longrightarrow$$

$\frac{3}{4}$ gal.

(This is — gal.)

4 gal. 2 qt.

$$\begin{array}{r} 8 \text{ gal.} \quad 1 \text{ qt.} \\ - \quad 3 \text{ gal.} \quad 3 \text{ qt.} \\ \hline ? \end{array} \longrightarrow$$

$4\frac{1}{2}$ gal.

This is ___ $\frac{}{2}$ gal.)

TEST 14

4 qt.

1 gal. = ___ qt.

8 pt.,

4 qt.,

1 gal.

5 pt.
+ 3 pt.

___pt., or ___qt., or ___ gal.

8 qt.

9 gal. +
2 gal. =
11 gal.

12 qt.

10 gal. +
3 gal. =
13 gal.

6 gal.	3 qt.	
2 gal.	2 qt.	
+ 1 gal.	3 qt.	
	___	qt.

___gal. + ___gal. = ___ gal.

5 gal.	6 qt.	
3 gal.	2 qt.	
+ 2 gal.	4 qt.	
	___	qt.

___gal. + ___gal. = ___ gal.

2 gal. 2 qt.

(You will have to borrow.)

4 gal.	2 qt.	
- 1 gal.	4 qt.	⟶
?		

1 qt.

7 gal.	1 qt.	
- 6 gal.	4 qt.	⟶
?		

Review

Inches, feet, yards, and miles are used in

√ a.

___ a. linear measurement.

___ b. weight measurement.

Weight measurement is given in

√ b.

___ a. cups, pints, quarts, and gallons.

___ b. ounces, pounds, hundred-weight, and tons.

We use fluid ounces in

√ b.

___ a. area measurement.

___ b. liquid measurement.

Measurements of area are given in

√ a.

___ a. square inches, square feet, square yards, and square miles.

___ b. inches, feet, yards, and miles.

pounds

Pressure is given in < pounds. / yards.

Height, depth, width, distance, and length are all

√ a.

___ a. linear measurements.

___ b. area measurements.

Are thickness and diameter also linear measurements?

√ yes

___ yes

___ no

We use distance and time to find "rate of speed."

rate of speed =

√ b. ___ a. $\frac{\text{time}}{\text{distance}}$ ___ b. $\frac{\text{distance}}{\text{time}}$

hour "mph" is short for "miles per" height. / hour.

Give the abbreviations for:

in.	inches	_____
ft.	feet	_____
yd.	yards	_____
mi.	miles	_____ or m
sq. yd.	square yards	_____
oz.	ounces	_____
lb.	pounds	_____
T.	tons	_____
cwt.	hundred-weight	_____
fl. oz.	fluid ounces	_____
C.	cups	_____
pt.	pints	_____
qt.	quarts	_____
gal.	gallons	_____

Besides the abbreviations in. for "inches" and ft. for "feet," we also use the signs ' and " .

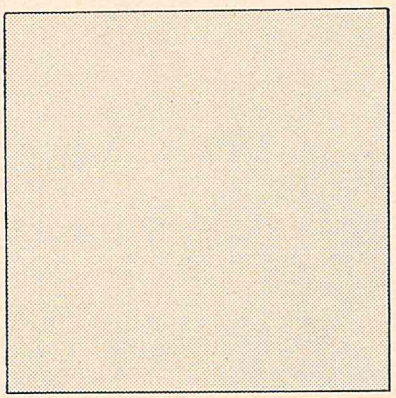
Which is the sign for inches?

___ a. '

✓ b. ___ b. "

---

yes



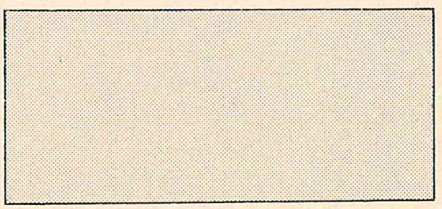
Is this a square? yes / no

25 sq. in.

Its area is ____ sq. in.

---

no



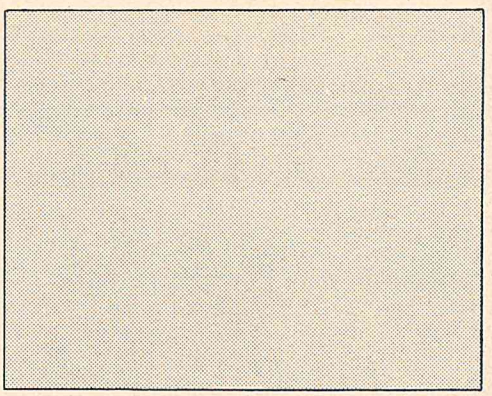
Is this a square? yes / no

yes

Is it a rectangle? yes / no

36 sq. ft.

Its area is ____ sq. ft.



20 sq. yd.

The area of this rectangle is ____ sq. yd.

---

144 sq. in.

1 sq. ft. = _____ sq. in.

1 sq. yd.

9 sq. ft. = ___ sq. yd.

16 oz.

1 lb. = ____ oz.

$\frac{1}{4}$ lb.

4 oz. = $\frac{\quad}{4}$ lb.

5 cwt.

500 lb. = ___ cwt.

2,000 lb.

1 T. = _____ lb.

Check the items you buy by weight:

√ sugar

___ sugar

___ fuel oil

√ flour

___ flour

√ meat

___ meat

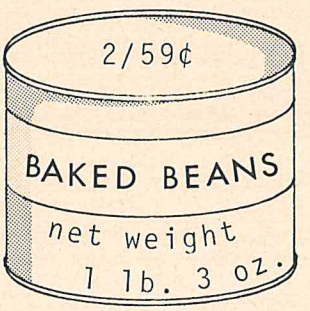
___ eggs

√ a.

The net weight marked on this can shows the weight of

___ a. the food only.

___ b. the food and the can.



2/59¢ means you can buy

1
2
> cans for $.59.

The beans in each can weigh ___ lb. ___ oz.

2

1 lb. 3 oz.

2 lb. 6 oz.

You can buy ___ lb. ___ oz. of beans for $.59.

---

18 oz.

$$\begin{array}{r} 5 \text{ lb. } 9 \text{ oz.} \\ +\ 6 \text{ lb. } 9 \text{ oz.} \\ \hline \quad\quad __ \text{ oz.} \end{array}$$

11 lb. +
1 lb. 2 oz. =
12 lb. 2 oz.,
$12\frac{1}{8}$ lb.

___lb. + ___lb. ___oz. = ___lb. ___oz.,

or ___ — lb.

8	There are ___ fluid ounces in 1 cup.
16	2 C. = ___ fl. oz.
1 pt.	2 C. = 1 pt. / 1 qt.
2 pt.	___ pt. = 1 qt.
4 qt.	1 gal. = ___ qt.
2 qt.	$\frac{1}{2}$ gal. = ___ qt.
4 fl. oz.	$\frac{1}{2}$ cup = ___ fl. oz.
$\frac{1}{2}$ pt.	1 C. = ___ pt.
16	You have 1 gal. of cider. How many 8-ounce glasses can you fill? ___
2 gal. 2 qt.	6 gal. 1 qt. - 3 gal. 3 qt. ⟶ ?

FINAL EXAM

Side 2

1 sq. ft. = _____ sq. in.

1 sq. yd. = ___ sq. ft.

---

	18 sq. ft.	85 sq. in.		34 sq. ft.	3 sq. in.
+	8 sq. ft.	59 sq. in.	-	20 sq. ft.	67 sq. in.

Long distances are measured in feet. / miles.

We give the weight of meat in pounds and ounces. / quarts.

Give the abbreviations for:

feet _____ ounces _____ yards _____ gallons _____

---

1 cwt. = ____ lb. 2,000 lb. = ___ T. 1 T. = ____ cwt.

---

	3 qt.	1 pt.		5 C.	3 fl. oz.
+	2 qt.	1 pt.	-	2 C.	7 fl. oz.

---

1 gal. = ___ qt. 1 gal. = ___ pt.

---

	2 gal.	2 qt.		9 gal.	3 qt.
-	1 gal.	3 qt.	+	4 gal.	2 qt.

If a man drove 300 miles in 6 hours, he drove at a rate of ____ mph.

A Sullivan Associates Program

25
3629